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THE FOUNDRY

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Trade Outlook.

Reports from all sections of the country indicate that many foundries find themselves compelled to either run light handed or to close down for a day or two at a time, simply because they do not have the iron wherewith to fill their molds. From being haunted by agents of furnaces anxious to sell him iron in any quantity, the foundryman finds this condition of affairs transposed and now it is the producer or holder of iron who has trouble in keeping out of the way of those who would be only too glad to give him orders. Many large melters have representatives on the road buying up anything in the way of scrap or pig iron which comes anywhere near meeting their requirements for melting stock. Not in the memory of the present generation have such conditions prevailed, where the seller can fold his hands and let the buyer do the worrying.

The much repeated assertion that there will be iron enough for everybody after a while is no comfort whatever to those founders who are unfortunate in not having enough of this article to operate their shops to their required capacity. The melter whose yard is bare of iron does not care what takes place six months hence, his present need is to him the only thing in sight. Many concerns who thought they had covered their wants fully find that new work has come to them faster than anticipated, and while furnaces are making the utmost endeavor to take care of their regular trade, there is some complaint of contracted deliveries not being made on time. The few odd lots of iron it is possible to scare up are readily taken at a considerable premium over regular quotations. In short, the price of iron at the present time depends solely upon the time at which it can be handed over to the purchaser.

The five per cent advance granted by the stove founders to their molders assures another year's uninterrupted operation in this branch of the trade. One feature of the scarcity in finished material turned out by the steel mills, which is exceptionally severe in structural shapes, is that much of the iron work for buildings is being turned over to the foundries to avoid delay. Many large contracts have been placed for columns and other architectural castings which would never have reached the foundries if steel could be had within a reasonable length of time. However, this unlooked for trade only tends to further emphasize the already too apparent shortage in foundry irons.

New enterprises continue to come to the front, the steel casting industry being especially active in this respect. The enlargement of existing plants is the rule rather than the exception and manufacturers of all forms of foundry equipment have more trouble in supplying demands, within a time satisfactory to the purchaser, than to find orders.

The Stove Founders and Their Employes.

At the recent annual conference between representatives of the Stove Founders' National Defense Association and the Iron Molders' Union of North America, Chauncey H. Castle, on behalf of the founders, asked that the question of increasing the supply of mold-

ers, through a revision of the rules of the union now governing this subject or otherwise, be considered. Mr. Castle also brought up for discussion the regulations of local unions relating to limiting the hours for molding, limiting the amount a molder may earn per day, and the unnecessary losses entailed on both sides through a large number of molders absenting themselves and breaking heats after coming to the shop to work. In the interest of the molders, David Black brought before the meeting a number of subjects referring to shop conditions and rules, which had from time to time been the cause of friction in certain localities.

The report of the committee appointed to take up these questions shows with what care each side considered the grievances of the other, and the relative friendliness of spirit which prevail in discussions affecting either party. Where the inability of a stove founder to obtain molders is shown not to be due to unfavorable shop conditions, relief is afforded him in the permission granted to employ additional apprentices. The limitation of a day's earnings is also conceded by the molders not to be in line with good practice. On the other hand the employers grant the justice of giving a molder a day at the regular day rate to become accustomed to new jobs and advise the prompt pricing of new patterns. The recommendation that a shop be so managed that the molder shall lose no time through changing jobs is also in accord with the policy of the two bodies to abolish causes for dissatisfaction between their respective members. The report as adopted reads:

From representations made by the members of the Conference Committee representing the S. F. N. D. A., to the effect that during the trade activity which has been a feature of the past two or three years, many of their members have suffered considerable inconvenience and loss from their inability to secure a full complement of journeymen molders to satisfy their needs, this committee is of the opinion that some of the complaints were well grounded.

Inasmuch as the S. F. N. D. A. has sought to relieve the situation by securing the assent of the I. M. U. of N. A. to a modification of its present apprentice law of one apprentice to eight journeymen, and said proposition has been rejected by that body, this committee is asked to suggest means by which relief might be given a manufacturer who, by actual demonstration, has been shown to suffer, to the injury of his business, from a dearth of molders.

The expressed thought of the stove manufacturers, as stated by their representatives, is not to abuse such measure of relief as may be devised, but to secure relief, when through exceptional trade conditions a sufficient supply of journeymen molders cannot be secured, after reasonable effort on the part of the manufacturer and the molders in his employ.

This committee in view of these representations and the expressed purpose of the stove manufacturers as stated, therefore recommend as follows:

When it becomes apparent that the business of any member of the S. F. N. D. A., in whose foundry the ratio of one apprentice to eight journeymen is being observed, is being injuriously affected by his inability to secure a sufficient supply of journeymen molders, under the circumstances and conditions, and after the effort, previously mentioned; we would recommend that when the presidents, or their representatives of the S. F. N. D. A. and the I. M. U. of N. A., after due investigation are convinced that the manufacturer is suffering as set forth, through no fault of the prices or conditions prevailing in his foundry, they should by and with the consent of the employer and the shop committee of the foundry at interest agree to allow the employment of such additional number of apprentices as may be required and mutually agreed to.

If it be found that inability to secure and hold journeymen molders is due to an inequality or low standard of molding prices or undesirable shop conditions, it shall devolve upon the two presidents or their representatives to at once take steps to remedy these prices or conditions in accordance with the standard prevailing in the district.

Further, when an additional number of apprentices is employed, the ratio thus established is not to be construed as a permanent one in such foundry, the manufacturer agreeing not to employ any more apprentices until the ratio originally obtaining in his foundry has again been reached.

We would also recommend that stove manufacturers avoid the policy of making up jobs which are so undesirable that in periods of demand for molders, few can be induced to work on them. Work which is of itself considered poor, should be divided up as much as possible, so that no molder would suffer unduly.

We feel that oftentimes molders decline to accept jobs on this account.

It is understood and agreed by the representatives of the S. F. N. D. A. that when con-

sideration for the interests and need of their members is shown by agreement to allow the employment of an additional number of boys, that act is not to be construed as a precedent to govern other foundries in the same district, nor to be used as an argument in favor of their enjoyment of the same right, which it is understood is agreed to simply as a remedial measure.

It is further recommended that the policy as above outlined be pursued by the parties to this conference until the assembling of the Toronto Convention of the I. M. U. of N. A. next July; and a committee of the S. F. N. D. A. is hereby invited by the representatives of the I. M. U. of N. A. attending this conference to meet with that body or a committee thereof to confer upon the subject of an equitable apprentice ratio, with the view of reaching an agreement to govern the members of both associations thereafter.

In the event of a failure of the two presidents, or their representatives, the shop committee and employer, to agree in their findings, it is understood that the rights of the S. F. N. D. A. or the I. M. U. of N. A. to adopt such measures as they may deem advisable to protect the interests of their members are not abridged.

Nothing in the foregoing shall be construed as changing the attitude of either association upon the general proposition of the apprentice question.

The general trend of industrial development is in employing skilled labor, as far as practicable, at skilled work, and in conformity with this tendency we are of the opinion that every effort should be made by the members of the two associations to enable the molder to give seven hours' service per day at molding, and to encourage the use of unskilled help to perform such work as sand cutting and work of like character, when the molder can be given a full day's work.

Inasmuch as it is conceded by the members of the S. F. N. D. A. that the earnings of a molder should exercise no influence upon the molding price of work, which is set according to well-established precedent and rule of conference agreements, by comparison with other work of a like kind, the placing of a limit upon the earnings of a molder in the seven hours of molding should be discountenanced in shops of members of the S. F. N. D. A.

Molders who may be employed as "cat skinners" should receive at least the minimum rate of day wages prevailing in the stove plate foundries of the locality, but should they earn more than the minimum rate, computing the value of their output at the piece price rate, they should be paid the piece price rate.

When a full floor of new work is given a molder, he shall be guaranteed the day-work rate of pay for the first day, in order that he may be given an opportunity to get the job in good running order for piece work; if, however, the molder should earn more than the day-work rate he shall be paid his full earnings.

In many instances the spirit of Clause 10, Conference 1896, which requires that prices on new work shall be set within two weeks, is grievously violated, entailing not only unpleasantness but a great deal of expense upon local unions for the services of their committees. We would suggest that strict compliance with the spirit of Clause 10 be made a special subject of recommendation by the representatives of the association to their members to the end that the two weeks' grace be not exceeded and work be priced with promptness and dispatch.

Where a change of job is made the molder often loses considerable time and is put to great inconvenience through the necessary clamps, boards and other facilities needed for the job not being supplied to him promptly. We believe that in well regulated shops, that should be made a feature of the shop management and should be a subject of favorable recommendation to the members of the S. F. N. D. A.

Patent Office Language.

One would naturally suppose that a great deal of satisfaction could be derived from reading the description of new devices as these are turned out from the patent office, yet those who have tried it will acknowledge that there is a certain amount of weariness in the "substantially as set forth" manner in which the claims are cited. One of our contemporaries in describing a "mold for castings," with the aid of information from the patent authorities, says:

"The object of this invention is to provide the necessary quantity of metal to feed any shrinkage which may occur in the casting. This object is carried out by providing a riser box placed in the sand of the cope and communicating with the mold cavity, the lower portion of the box being contracted and open and its upper end having a comparatively small opening for the escape of air. When the metal is poured into the mold through the pouring

opening, it fills the cavity of the mold and rises into the riser box, whereby a portion of the metal in the riser box will flow back into the mold-cavity so as to compensate for any shrinkage in the casting. When the casting has solidified, it is removed from the mold and the body of metal formed in the riser box is broken off, leaving a clean fracture which does not need to be ground. The cleanness of the fracture is due to the fact that the riser box is formed of hard and dense material, such as baked core sand, so that its edges will not crumble when in contact with the hot metal, and the angle of division between the metal cast therein and the casting within the mold will therefore be sharp and well defined."

All of which leads us to ask: Does this really deal with a mold or a riser, and if the latter, wherein does it differ from other risers? It is a well-known fact that a riser will break off square providing its junction with the casting is not filleted, and sometimes it will also break off partly below the surface of the casting; especially is this the case where the metal is open grained. We turn this whole thing over to the men in the shops for dissection in the hope that they may be able to find more solid meat in it than we have been able to locate.

The Foundry Trade School.

In the April issue of THE FOUNDRY appears an article by Mr. Thos. D. West advocating the establishment of a practical school which shall be capable of teaching a wider scope of foundry work than is now possible in the majority of shops. The statement is made that the specialty manufacturer demands the best of a man as a true and skilled mechanic, and gives the general impression that the all-around jobbing molder is demanded by this class of foundries. Such is surely not the case, as we are satisfied that Mr. West is not making special efforts to obtain the best of journeymen molders to make his ingot molds. In a general way we hold the opinion that the specialty molder will produce a larger output than the jobbing molder of wider experience and as results are the one measure which determines the value of each there can be but little hope that the practice as now carried on will be changed.

While Mr. West advocates a rather strenuous four years apprenticeship, Mr. E. H. Putnam, who with Dr. Moldenke and Mr. West compose the committee appointed by the American Foundrymen's Association to investigate the feasibility of starting a trade school along the lines proposed by the latter, takes the ground that a shortening of the apprenticeship to two years would be of general benefit to both founders and workmen, and meet conditions of today better than the long-term system which originated when manufacturing was carried on along entirely different lines. Among other things, Mr. Putnam says:

"Of course no man can learn molding in three years; very few can learn it in twenty-three years; in fact, few men have ever come anywhere near to mastering the trade, no matter how long they followed it. Nevertheless, I have several apprentices in the shop just now who are better molders than some of the fellows who are drifting about the country with union cards in their pockets—apprentices who will do the general run of work in our line quite as well as a large per cent of the journeymen molders who come to us from other cities. True, they will improve with time; but would it not be as well to pay them the full journeymen's price for piece work, classing them as journeymen, and thus make room for additional apprentices without exceeding the union limit?

"If the advocate of a long apprenticeship could insure properly progressive advances in opportunity to learn all that can be learned in the shop, I confess I should not feel disposed to oppose him very strenuously. But, with the glaring fact before us, namely, that men are usually placed where they will be of greatest profit, and are kept there, year in and year out, and that this practice applies with equal force to apprentices in many shops, and in large measure in most shops, the plea for a prolonged apprenticeship in the interest of the apprentice's education loses a great deal of force.

"The day of the all-around molder is past. This is the rule; the exceptions will number less and less with each succeeding year. Of course there will always be all-around molders, but they will be individuals, as a rule, who are ambitious to learn all that they can in order to fit themselves as managers of foundries. The great mass will not only lack this ambition, but they will be effectively barred from prosecuting it. As surely as that the system of division of labor is a true economic measure, so surely will it be insisted upon until it shall be as highly perfected as possible. That is to say, the activities of the mechanic are to be confined to constantly narrowing fields instead of being expanded over diversified operations as in the past.

"There are many foundries where one year's

practice will perfect a molder for the service necessarily required of him in those particular foundries.

"'But,' says one, 'this does not fit the man for service in other foundries generally.'

"No. But what is the matter with 'other foundries generally' fitting their own supply of molders?

"'But the molder does not wish to be confined to any one class of work; he wants to be able to take a job in foundries engaged on diverse lines of product.'

"Very good; there is nothing in his way that I can see. And the best way for him to fit himself for all-around work is to work in different foundries on various classes of work.

"The truth is that the limits upon apprenticeship both as to the number of apprentices and time of service have greatly handicapped the trade, and but for the 'open' shops, where molders are made as fast as wanted, the business would have been very seriously crippled.

"The apprentices frequently take matters in their own hands and curtail their period of service without so much as saying 'by your leave.'

"They go away, and, finding an 'open' shop, engaged in a line of work with which they are familiar, take a piece-work job and make as good wages as any. In fact, it is common knowledge that in many foundries the apprentices, working by the piece, would make as much as the journeymen before the expiration of their first year, if paid the full price."

P. McNaughton, in a letter to the *American Machinist*, proposes a course directly opposite to that of Mr. Putnam and one which would hardly receive the indorsement of shop owners, if of the trade affected. Mr. McNaughton makes the common mistake of supposing that a uniform length of apprenticeship will in itself insure a supply of high-grade mechanics. The boy who resigns his job without permission before his time is up is really gaining much more experience in knocking around from one shop to another than he is commonly credited with. Then again, one apprentice will learn so much faster than another, that to say that each shall spend the same length of time before he receives journeyman's wages is as much out of the course of progress as to say that one workman shall do no more than another, no matter what his individual abilities are. Mr. McNaughton's ideas of what should be done with an apprentice to the molder's trade is expressed in the following:

"I think there is a better plan than to have such schools as are proposed. First, let the government pass a good indenture law binding the apprentice for four years to the foundry trade, covering the branches of green and dry sand and loam molding, mixing and melting iron, mixing core sand and making cores. Have the same bonds protect the apprentice by binding the proprietor to offer every opportunity to the apprentice that the shop affords to perfect him in the acquisition of his trade. By this method a proprietor will not be afraid to push an apprentice to his highest usefulness, as he will not fear the loss of the apprentice. As it is now, as soon as the majority of our young men are able to make one piece there is a desire on their part to make money, and they seek other shops at an advance, so that the party a young man starts with seldom gets money out of him before he is gone.

"Then, again, if only those who held government licenses could draw molder's pay it would go a good way towards filling our country with all-around mechanics. It is impossible to place such men where they cannot work out.

"If you are going to do anything in the line mentioned by Mr. West, let it be in the way of a technical institute, open only to such as have served a prescribed apprenticeship or worked the four years. You will find that not many will be dazzled by the additional information, and those who are will find some way to avail themselves of the advantage; while in the method suggested by Mr. West not 10 per cent of the student molders would ever be heard from. Colleges are all right to refit and finish up a mechanical investigator or a student, but are not much good in building from the bottom, unless the subject is particularly adapted to the calling, and then it would be better for him to get shop-wise in actual shop practice before his college course."

Oil and Gas as a Fuel for Brass Furnaces.

Past references to the use of oil or gas as a fuel for brass furnaces and the general effect of same upon the life of the crucible seems to have been unfavorable to these fuels. The opinions on this subject which have appeared in our columns were all from concerns whose experience gave weight to their testimony. Mr. T. R. Brown of Wilmerding, Pa., writes us to the effect that he considers some of the statements made rather at variance with actual facts and while he does not answer these in detail he refers to what a leading foundry has

recently accomplished along these lines as follows:

"The Westinghouse Air Brake Co., Wilmerding, Pa., are at present completing the installation of twenty furnaces of the tilting type, equipped with crucibles of 500 pounds capacity each; the burner a combination type, using either oil or gas at will, this form of furnace having been adopted as standard after a most exhaustive test covering a period of a number of months, in which it was found that the life of the crucible used has been increased from an average of 18 heats per crucible to as high as 69 heats per crucible, the waste of the metal averaging 1.6 per cent; five straight heats of 500 pounds each per day per furnace being the output, with an expense for gas fuel, at 10 cents per thousand feet of not exceeding 40 cents per ton of metal melted; and with oil, 82 cents per ton of metal melted.

"The writer knows as a result of personal observation, covering the utmost detail, that there is absolutely no difference in the wear of the crucible with the use of either oil or gas, and that there is no difficulty whatever in maintaining a straight average of from 50 to 60 heats per crucible."

We will thank others of our readers who have had any practical experience in the use of oil or gas as a fuel for brass furnaces to advise us of the relative economy of these fuels compared with coal or coke, and any differences they may have noted in the life of the crucibles under varying conditions.

A Stock Company Laboratory.

I have read Mr. West's letter on the above subject in your April number with much interest and also think the "Co-operative" form of laboratory will help the founders who can not undertake the establishment of a chemical department of their own. While the payment of ten dollars for six determinations is not at all too much for the work this represents, yet to derive profit from the use of chemistry in the foundry it must be applied continuously, and the expense this would entail is simply prohibitive at the rate quoted above.

The question, however, has an entirely different aspect for the foundry in which there is someone who can use the results of chemical work. Here it will soon be found that the total number of determinations a week can be cut down to some ten in all and these should be obtainable at considerably less than ten dollars when made all the year around. There should be no difficulty in having determinations of silicon and sulphur made at seventy-five cents apiece by any reputable laboratory, provided at least six determinations a week are furnished regularly.

As, however, there are but few foundries at the present time in which the necessary talent for utilizing chemistry is available these foundries should get together, establish a laboratory convenient to all concerned, engage a first-rate metallurgist, give him enough assistance for the more manual part of the work, and they will find this a paying investment. Not only would the actual determinations cost less but expert advice based upon the daily records of the foundries in question would be available.

Inadvertently it might be stated that a careful analyst can easily make twenty-five silicon determinations daily and get correct results. If the fixed charges of a laboratory together with salaries of four men should amount to twenty-five dollars daily, enough work could be done to make the cost of each separate determination less than twenty-five cents. From a purely business standpoint, therefore, it would pay the foundries of a given district to look into the matter closely, and they will find Mr. West's proposition to pay them well.

RICHARD MOLDENKE.

Crucible Steel.

Crucible steel, as distinguished from other steel, means steel made in a graphite crucible. The output for the United States for a series of years is as follows:

1874	32,436	Tons
1880	64,664	"
1890	71,175	"
1899	101,213	"
1900	100,562	"

To produce the quantity for year 1900, took an immense number of graphite crucibles. The cry has been for years that "crucible steel is doomed"—but the product as reported above does not show it.—*Graphite.*

Three new foundries are to be erected in Brooklyn, N. Y., during the year. Wm. H. Holdsworth & Son have outgrown the capacity of their present quarters and will build a modern foundry. Chas. A. Friberg, maker of architectural castings, 412 Driggs avenue, and Taylor & Co., 415 Driggs avenue, will also be compelled to seek new locations, as the property on which they are now situated has been condemned by the city for park purposes.

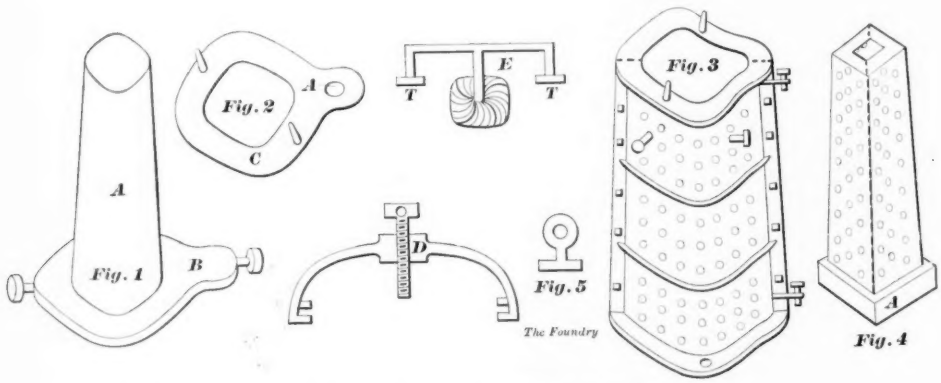
Some Large Castings.

The illustration appearing herewith shows one of a lot of twenty-eight blowing engine housings made by the foundry department of the Lebanon Mfg. Co., of Lebanon, Pa., a corporation which has been succeeded by M. H. Treadwell & Co. These castings were made for the E. P. Allis Co., of Milwaukee, Wis., and attracted considerable attention while in the yards of the Treadwell Co., as not a single one was lost and every one came out perfect.

Each casting measures 11 feet in height, 8 feet in diameter at the large end and 7 feet in diameter at the small end, and weigh 24 tons. They were swept up in loam and it required four molders to complete one in about two weeks' time. These castings were turned out under the direction of John H. Killinger, superintendent of the works.

Making Ingot Molds.

Although the making of ingot molds is generally performed by laborers instead of molders, the method of turning out these castings may be of general interest to the readers. Among the rigs for turning out this class of castings which have come under my notice is the one herewith illustrated. A Fig. 1 is bolted to the stool B, which is retained in one corner of the pit at all times unless repairs have to be made on the same, when it is hoisted out by the trunnions. Fig. 2 is a plate one inch thick, planed on both sides, which is lowered over the pattern and fits snug on the stool B, the surface of which is also



RIGGING FOR MOLDING INGOT MOLDS.

planed. There are no pins on the stool, as the shape of the plate conforms to that of the pattern and brings it into the proper position. The cheek, Fig. 3, is lowered over the pattern and is brought into position by the pins on the plate. Both the top and bottom joints of the cheek are planed also, as well as the perpendicular ones, where the sides are bolted together. All bolts are loose when the cheek is lowered to allow both sides to settle perfectly on the plate, after which they are all tightened and the plate, Fig. 2, firmly keyed to the cheek. A long gate pin fits into the slot A, Fig. 2.

There is only about two and a half inches of sand between the pattern and flask and a very small flange at the bottom of the latter is all there is to keep the sand from slipping out after it is rammed up. The sides are perforated as shown, which perhaps helps to hold it as well as assist in the quick drying of the mold by allowing the gases an easy chance to escape. A special mixture of facing sand is used to ram up the mold for the first six or eight inches, but after that the ordinary heap sand, which is burned red and resembles ashes more than molding sand, is used altogether. After the mold is rammed near enough to the top the lugs and eyes are located, joint made, and the cope rammed up, lifted off and set aside to await the return of that particular mold on the next day, the copes being used green. After the joint is brushed off a plate is put over the pattern and then the yoke D is placed in position with the slots gripping top part of flange of cheek and the screw in the center run down to touch plate on top of pattern, when chains are hitched onto the cheek portion of the mold and a good strain taken which starts the entire arrangement off the floor, at the same time the screw is being turned to force the pattern down, after which the cheek is hoisted to the top of the pit. The plate, Fig. 2, being keyed to the bottom of the cheek prevents any sand from being dragged or torn off, even though it does rub against the pattern all the way up. After the gate is cut the plate, Fig. 2, is taken off and the flask swung over a blacking bosh, and lowered on it for the purpose of steadying it, when a man mounts to the top and without releasing the chains proceeds to number and mark the mold and then places the contrivance shown at E inside of same, with the two rests T T touching the joint of the flask, thus allowing the part E to be six or eight inches below the joint. E leaves a space of about three-quarters of an inch between it and the surface of the

mold when two or three buckets of blacking are poured in and distributed as equally as possible, which invariably results in a perfect coat of blacking being distributed over the entire interior of the mold, barring the gate, which receives separate treatment. After this is done the mold is hoisted up and examined for defective spots or streaks which the blacking may have failed to reach. This sometimes occurs when the latter is too thick. The average ingot mold is about six feet in length and after being blackened is placed on a car ready to be run into the drying ovens.

All the drags to be used for the day are spread out on the floor and are so fitted up as to fit the cheek exactly. Like the copes they are about six inches deep and the bottom plate, which is necessarily heavy, is attached to the drag permanently. The print of the core is all that shows after the drag is finished. The pattern of the print is secured to two cross pieces which have pin holes and rest on the joint, thus locating the print in its right position. The cross pieces are clamped to the joint for the cheek to rest upon. When putting these molds together the drags are all located in the pit and the cores are set and the cheeks lowered to the proper places and solidly clamped to the bottom parts. In shaking out, all the bolts, back and front, are taken out except the two bottom ones. After the cope is removed, cheek, drag and all are hoisted out, the drag dropped where wanted and the cheek carried to its proper place, when the two bottom bolts are taken out and the casting dropped, leaving all the sand clinging to it after the cheek is taken away.

Fig. 4 is the style of the core barrels used. It is made of cast iron, it is hollow and perforated with oblong holes A. The base is the print and is planed off so as to fit accurately in the print of the drag, as well as in the print of the core box, which is stationary, has hinges and can be opened up, and resembles very much the cheek in construction. Fig. 5 is a key used to handle the cores either green or dried. By inserting it in the top of the core and giving it a quarter turn it will neither pull out nor fall in. In the molding of these core barrels the pattern is split as indicated by dotted lines in Fig. 4. Usually they are bedded in the floor when molding them, thus leaving two sides in the cope and two in the drag. From this it will readily be seen that core prints attached to the pattern would tend to tear the entire surface of the mold in drawing the pattern, particularly if they were long enough to support the cores in the position these must occupy. This is overcome in a very simple manner by having a board the exact length and width of a side of the core-barrel in which is located holes having the desired shape when the prints are made as deep as necessary with a punch by pushing it through these holes in the board. The little cores are then set in the drag, where the main core touches them slightly in addition to the bearing, which is provided for it at each end. The cope side of the mold receives the same treatment as the drag, but in setting the cores these are usually dipped for about half the length of the print in paste and in addition the sand is packed around them and sleeked, all of which secures them in the proper place and guards against them dropping out when the cope is turned over.

Another rig for making ingot molds has come under my observation in which the cheek is made of solid rings eighteen inches deep placed on the top of one another, and all bolted together. When the cheek is rammed up and the pattern ready to be drawn, the whole thing is then hoisted off together and removed to a convenient corner of the pit, the bottom joint is hardened and sleeked up and then swabbed, when one man mounts a step ladder, armed with a sledge, while another one remains below with both hands on the sand joint. At a signal the man at the top goes to work with the sledge drawing the pattern and when this falls it may knock the man down by falling against him and maybe it will not. Sometimes a wheelbarrow full of sand dropped with the pattern, at another time less, anyhow, the first mentioned method of making ingot molds is generally considered the best.

RICHARD M. BARNETT.

Want Recognition as Mechanics.

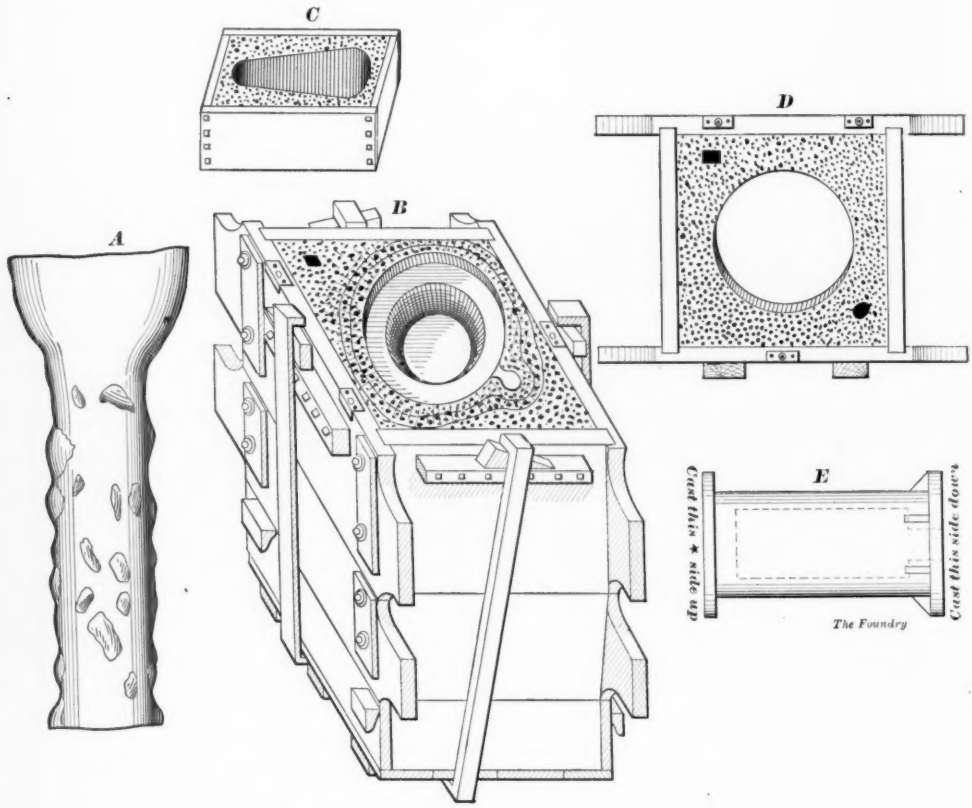
This evening it is proposed to have a meeting of the molders' helpers, who number about 285, for the purpose of taking steps to organize a union. It is then proposed to demand a regular scale of wages. The men claim that at present they are considered common laborers, but in reality they have to be skilled men to do the work.—*St. Paul (Minn.) Dispatch.*

A new concern, known as the General Foundry Co., composed of Gustav Hoglund, for many years connected with the Central Oil and Gas Stove Co., and several of the stockholders in the Simplex Time Recorder Co., will build a foundry, 40x80 feet, at Gardner, Mass.

Some Trials of a Jobbing Foundry.

The iron foundry in general and the jobbing foundry in particular, which has customers who know enough about the foundry business to be cognizant of some of the difficulties which beset green sand molding in general, is fortunate. Those who realize how narrow the margin sometimes is between comparative success and entire failure are indeed blessed. How rare it is to get a casting of any size and weight perfect. It may look so when in the rough, but many of the neatest looking castings are consigned to the scrap heap as soon as the machinist goes to digging into them. A certain casting of fairly simple design was giving much trouble through imperfections showing up when it was attempted to finish it, and these were generally of such a character as to unfit the casting for the purpose intended. The foundry foreman became quite disturbed over continual failures, but the molder knows, as every indifferent workman does, that the trouble with this particular casting was due to poor, sluggish, dirty iron, notwithstanding the fact that the other molders poured their work at the same time and into far more exacting castings, yet did not experience any trouble in obtaining perfect soundness in the work they made.

After attentively having observed this molder ramming up and finishing several molds the foreman one day gave orders to the night man who took out all the castings to save all the gates which came from this molder's floor, and not distribute them among the balance of the scrap as was usually the case. The next morning these gates were cleaned of all sand and the molder was invited to come out and inspect them. Fig. A is a fair representation of what these gates looked like and a fair specimen of sand cutting. When the molder learned to remedy his defective gates the quality of the castings improved at once, although the



SECURING CLEAN CASTINGS UNDER DIFFICULTIES.

mixture of iron was not changed in the least.

I append some sketches and I confess some of these are not as good as they should be, to show the method used in molding and casting a cylinder for a small hydraulic press. See Fig. E. It may be well enough to state that this casting had more loose pieces to it in the shape of projections than the drawing shows, especially on the end marked with a star, consequently, it was impossible to cast any surplus metal upon it at this end in the shape of a sinking head, as is done in some cylinder castings where the top is removed to guard against dirty surfaces. The top as cast, as we say, in foundry parlance and the sketch is simply to illustrate what was done and has been done in cases of this kind to secure an absolute sound casting.

This pattern arrived at the foundry, marked one tomorrow, nothing more. It was simply a plain looking cylinder for a hydraulic press of some kind and the pattern was marked to be cast on end, as shown. It was duly molded and cast as per rules made and followed in such cases, and the casting delivered. A few hours after delivery the telephone bell rang and the foreman was informed that the casting was no good. Inquiring as to the reason he was informed that it was dirty on the top as cast. The foreman answered that he had examined that casting without noticing anything suspicious about it, and furthermore that since there were three inches of metal at that point he would guarantee it to never leak or crack. The customer replied that this was all granted, but that the casting was to be finished all over externally and that if a speck as large as a pea was found the proprietor of the machine shop would refuse to send it away. Said he, at the other end of the 'phone, "This is to be a kind of toy like and show job, you know, and we are going to head the procession for smooth, finished work, and say, we have not much time to execute the work in either, so don't bother us this way again."

This was a pretty how do you do, to give a foundry foreman. The words "Don't bother us this way again" kept ringing in his ears. To him it seemed as if it was something unreasonable to suppose that he would make work imperfect simply to bother his customers.

To cast a piece of this size, and 400 pounds was its weight, in the shape of a hydraulic cylinder and not have a speck in it externally, I thought was very nearly beyond the possibility of accomplishment, but it had to be absolutely without a speck. It was finished all over. It was a show job, and furthermore, it had to be made in green sand of cast iron, a metal known to be a conglomeration of impurities, which, when the metal is liquid and subject to the least agitation will collect in different sized bodies and floats upon the metal while the mold is being filled. When this stage is reached the impurities are securely fastened in the metal, and there you are.

The foreman went over to the machine shop and there it was explained just what was wanted. If the same information had been sent along with the order it might have made some difference in the treatment accorded to the first mold. The press which this concern was building was to be a way up job to be sent to some fair for a concentrated food manufacturing company. The case was a swell affair, a competition show, at the State Fair, and the builder of this machine was bound to have something which would give him a walk-over as far as style and finish would go.

Then we began to be plied with questions as to when we could deliver another casting, to which we made answer that we would do the best we could, but to get absolute perfection in a casting of that weight was well nigh an impossibility. We told them the difference between good enough and absolute perfection was a very great one in the world of castings. These kind of peremptory orders are kind of tantalizing but they certainly do set one to thinking.

That evening as I lifted a speck from my cup of tea at supper time the thought occurred to me to cast this piece open and if any dirt appeared in the casting to lift it out with the skimmer. The next day we had a flask made an inch deeper than the length of the pattern, in order to pour through the runner box D until the mold is nearly full so the runner C could be lifted off and leave the top of gate clean and perfect for the cope, Fig. D. The runner box was rammed up and placed upon the cheek after the removal of the cope before drawing the patterns with the gate in place for both the cope D and runner C, so that when the cope was put on the gate hole in cope and cheek would be in line.

The inlet gate at the bottom of the mold was so made that the metal was given a whirling motion as it entered the mold, thereby relegating all dirt to the center of the rising, whirling metal. As soon as the top of core was covered, all this happened and the invisible collection of dirt, or slag, soon came up and was easily lifted out with a skimmer. The runner box was removed, the cope put on, and

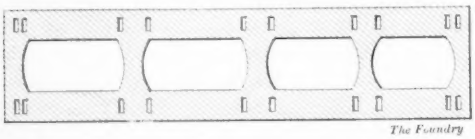
weighted down with pig iron and the process of casting finished. This casting proved a success and finished upon the top as cast without a speck, but the man who procured this casting could not for the life of him see why this was anything more than ordinary routine, and perhaps it is unreasonable to think that he should.

L. C. JEWETT.

Molding a Plate Planer Bed.

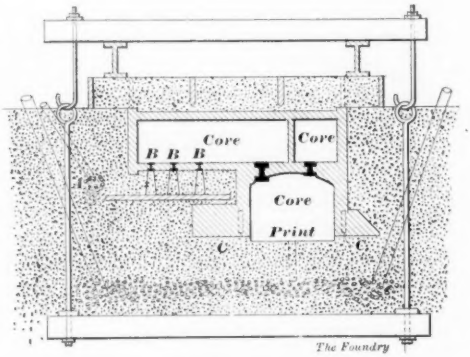
Some time ago we received an order for a set of castings for a plate planer. When the patterns arrived we found that the bed would be 35 feet and 6 inches long and likely to weigh about 18,000 pounds. It was decided to make this casting in green sand, as when we began business in our new shop about a year ago we had the roof painted white and have so far managed to keep it white, and we did not desire to smoke this up. Our new shop is spacious, well ventilated and well lighted, and we do not desire to dirty it up by skin drying the molds with ordinary fuel, as we are calculating to dry all of our floor work by means of producer gas. We have found it very good policy to keep smoke out of the shop and again we felt sure that we could make this casting successfully in green sand. One of our specialties is the production of lathe beds and we had a pit, which would just suit this job, arranged with cross binding bars 4 feet 6 inches apart and of a suitable depth.

Judging from our previous experience in making this class of castings we decided to lower this pattern 1⅝ inches at the center, in order that the casting might come out straight. Having provided a suitable coke



PLAN OF BED CASTING FOR PLATE PLANER.

bed underneath the mold we proceeded to sweep up a bed for the pattern to rest upon. This was done by leveling up three short straight edges across the pit, the center one having a piece 1⅝ inches thick fastened to its upper part. After the bed had been swept up level this extra thickness was removed from the center straight edge and the bed swept up according to the new lines. The pattern was then heavily weighted at its center. Comparatively plain ramming was to be done on one side of the pattern, but the other one presented some difficulties, as will be readily perceived by a glance at the sectional form of the mold. Owing to the heavy square "V's" on this side it was found necessary to make gratings to come from over the "V" right back and under the mold, the vents from this bed being connected, as shown at A. The top cores rested on chaplets, as shown at B, and these again on studs placed on top of the grating. The drawbacks were made in dry sand and dried in ovens. We had a drawback at each end containing two gates leading into the "V's," as shown in C.



SECTIONAL VIEW OF MOLD FOR PLATE PLANER BED, SHOWING METHOD OF BINDING.

When the cope had been taken off and the pattern drawn the mold presented a sorry looking appearance. The pattern was a very old one and had been lying exposed to the weather for about five years since it was last used, causing the loose pieces of the "V's" to stick to the pattern and breaking the mold up very badly, however with plenty of sprigs and spikes the mold was prepared and the work of coring commenced. All the difficulty in doing this lay in taking sufficient precaution to insure that the cores should rest on the studs and these in turn on the grating in sand above the "V." It will be seen in Fig. 2 that the print on the top core would catch the top part and the whole be bound from this. After the mold had been closed it is secured, as shown in the illustration. The binding bars were left on for 40 hours after the casting was poured, when this was removed to the cleaning room, where it was found to be perfectly straight and without a blemish. The molding was accomplished by three molders and two laborers in a little over five days. The exact weight of the casting was 18,564 pounds.

A. C. MILLAR.

Making Pattern and Core Boxes for Globe Valves.

There is no class of patterns or core boxes which, as a rule, are a more unwelcome job in the pattern shop than globe valves, and therefore the suggestion of an easy way to make them may possibly be appreciated. Fig. 1 shows three views of one-half of the pattern

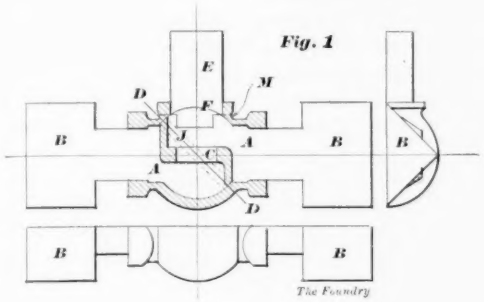


Fig. 1

with its core prints BB and E. This pattern made in halves can be turned between centers of print E, and the stem and flange glued at M and the prints B B squared by hand, as also the hexagon ends, which is all the hand work required on the pattern.

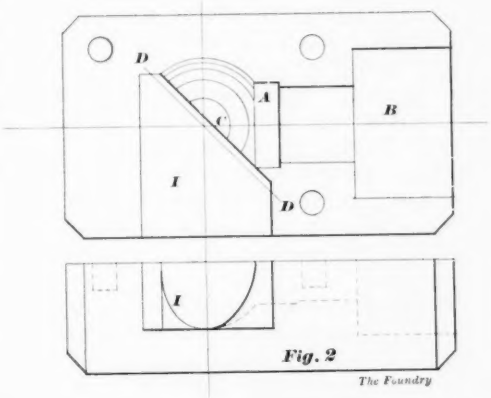


Fig. 2

Fig. 2 gives two views of one-half of the core box. The half hollow sphere is easily turned out and the box for core A B cut out by hand, also the square space I cut out past the 45 degree center line D D, just enough to form half the partition desired across the valve outside of the seat.

Fig. 3 contains two views of a square block I which should be turned out to a radius J to form the circular inner walls around the seat and to a depth just sufficient to reach the center C with a hole in the bottom, as at K, as large as desired through seat. After turning this block the corners should be cut off to just allow it to fit the space I of core box Fig. 2. Be careful to leave timber stand

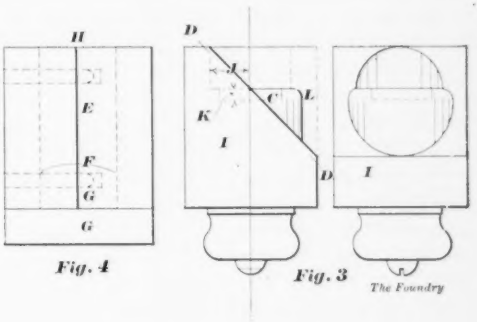


Fig. 4 Fig. 3

at I to form the outside of the circular wall around the seat. Fig. 4 is a side view of core box to make core E. This core requires one end to be cupped out to fit the spherical surface at F, in Fig. 1. This is easily done by turning the plug G with a spherical shaped end as at F, in Fig. 4. The square block I can be provided with handle to draw it out of box, as this must be drawn before the core box is separated. Which will leave the core A B stand on end to dry. Two cores A B are required.

EDWARD T. WIRES.

Chill Cores.

Having had a little experience in chilled bushings and wheels, the same may perhaps be of assistance to Mr. E. T. Harris. In the first place the chill pin need not be turned up in the lathe, if properly made from a good pattern. In making the pins the sand wants to be fine and rammed very hard, as, if the sand is not very porous, then the pins can be dressed or made ready for use with a piece of an old emery wheel or a file. It is a good idea to heat the pins and then quickly cover them with a little oil and plumbago. This treatment will not affect the chill if one uses good, cold blast iron. It is not wise to use these pins more than four or five times, as they get larger after each cast. It is best to have a template made and try the pins after each cast. It is also best to give these chills all the taper possible. A quarter of an inch in a length of eleven inches does really not give the taper required. I have used hundreds of pins without having these turned, and always obtained very fair results.

A. W. PEARSON.

A Useful Alloy of Copper, Nickel, Zinc and Aluminum for Sand Casting.

(ALUMINUM SILVER.)

So much attention has been paid in the past to the light aluminum alloys that many of the heavier and quite useful combinations of this element with other metals have been overlooked.

This statement is particularly true in the case of alloys of the heavy class which contain a small amount of aluminum (so small, indeed, that they can not properly be called aluminum alloys), which have distinctly valuable properties imparted to them by this addition. It is a fact not generally appreciated by foundrymen, that aluminum, if properly introduced in the right amount, forms a most valuable ingredient in brass and German silver alloys for sand castings and imparts to them qualities which they otherwise would not possess.

It is the latter combination or the alloy of copper, nickel, zinc and aluminum which I propose to describe, for this alloy certainly has not received the attention it deserves.

If an attempt is made to cast in sand a German silver alloy of, say 18 per cent nickel (or consisting of copper 62 per cent, zinc 20 per cent, nickel 18 per cent), immediate difficulties are encountered which render the casting of this alloy one of the most perplexing and exasperating problems with which the foundryman has to contend. If he makes his alloy from new metals he usually experiences some difficulty in melting the nickel, although such a trouble is hardly inherent in the alloy, but can be readily overcome by suitable manipulation. After his alloy has been made, and especially if it has been melted once or twice, the real difficulties begin. When an attempt is made to pour the metal into the mold, the sluggish nature of melted German silver is at once noticed. Even though the metal in the crucible may be "smoking hot," the foundryman is often surprised to find that it will scarcely run beyond the mouth of the gate and, indeed, the writer has often seen it, more particularly, perhaps, when all scrap had been used, so sluggish that it would not run at all; it finally had to be scraped out of the crucible with a skimmer. If, by chance, he happens to have forced the metal beyond the gate entrance, it is seldom that his castings have "run up" full, and even though they possibly may have done so, "cold shuts" and other imperfections make their appearance in the casting so as to render them of no use.

Perplexed at these obstacles, he heats his metal to a much higher temperature, and this time succeeds in getting his castings to run but again is confronted with additional difficulties. The castings are full of pin or blow holes, sand burned and covered with numerous imperfections produced by the oxide of zinc (spelter fumes) being drawn into the mold along with the metal. The necessarily high temperature of metal renders this difficulty almost unavoidable. The loss of spelter, occasioned by this high temperature, is of considerable importance and when the alloy has been melted several times the composition has materially changed.

It is not overdrawn, therefore, when it is said that German silver is a refractory and peculiar alloy. Those who have experienced its perplexing nature will heartily agree with me.

But let us add a small quantity of aluminum to this refractory substance and see what the result is. Of course, it is to be expected that an increase in hardness will result, and so it does, but in proportion to the amount which is introduced. The very nature of the alloy, however, almost seems to have been transformed; instead of the sluggish alloy one is obtained which fills the mold completely, even the sharpest corners. If ordinary care is exercised there is a complete absence of blow holes and the castings do not adhere to the sand, but the surface of them is as bright and clean as if they had been "tumbled." The increased fluidity of the alloy permits of a lower pouring temperature being used and, consequently, the loss of spelter is much lower than it otherwise would be. The color of the alloy, too, is much whiter than the corresponding alloy without aluminum.

It is remarkable how small an amount of aluminum will accomplish this result. The writer has repeatedly shown that less than 0.05 per cent will effect it. If the sprues are to be used and the metal melted over repeatedly, it is advisable to use a larger percentage and for such employment the writer has been accustomed to use 0.25 per cent of aluminum. This quantity enables one to make simple German silver castings without materially increasing the hardness of the alloy and possessing all the good properties which aluminum imparts to it.

By successively increasing the amount of aluminum there are produced alloys of different characteristics until the point is reached where the brittleness begins and the

toughness ceases. This is the dividing line between the useful and valueless alloys. Let the aluminum be added in the proportion of from three to three and one-half per cent and there is produced an alloy which is the nearest approach to tempered steel in all the non-corrosive alloys. This statement must not be taken too severely, however, for when the term tempered steel is used a material is meant which has little or no elongation, and, at the same time, possesses a high tensile strength. Could such a material be exactly reproduced, however, among the non-corrosive alloys it would be of doubtful value because of the difficulty of working it; in fact, there would be a limited use only in cases where no machine work would be required.

It is not so, however, with this copper, nickel, zinc and aluminum alloy which, although it is hard and stiff, is not beyond the power of the ordinary method of drilling or cutting metallic substances. By decreasing the content of aluminum, the hardness is likewise decreased, but at the expense of stiffness. The stiffest and hardest alloy, however, may be readily worked in the usual manner, but the speed of the machines used for cutting leaded brass or bronze must be somewhat reduced.

Let us first summarize the good qualities of this alloy so that its true application in the arts may be readily perceived:

1. The alloy is quite stiff and strong and cannot be bent without breaking.
2. It casts free from pin or blowholes or other imperfections.
3. The liquid metal completely fills the mold; thereby giving castings true to the pattern.
4. The cost of casting is not in excess of that of brass.
5. The alloy is non-corrosive and comparatively non-tarnishing.
6. The color is silver white.
7. The hardness permits of a high polish.

An alloy possessing the above qualities should readily find many uses in the arts and, while it has been employed to a limited extent for some time, the lack of familiarity of manufacturers with the alloy or perhaps their ignorance of its existence has been partially responsible for its retarded use. Unfortunately the majority of foundrymen have not become familiar with its peculiarities in casting and the proper method of melting so that until these obstacles have been overcome little headway can be made.

One of the first uses of this alloy was in the manufacture of some of the small parts of the typewriting machine, especially those parts such as a spacing lever, which require constant handling. Previous to this time these parts were made of malleable iron or of steel forgings and nickel-plated, but the difficulty of getting the plating to adhere and, even when well done, the constant friction would soon wear it off so that in a short time the unsightly base metal was left to rust at the first opportunity. Brass or bronze, of course, were out of the question, for once the nickel plate had been worn away the copper alloy was left to poison the fingers or to render them unsightly from the brassy stain. The use of brass on a typewriting machine would, of course, militate against the sale of it, unless used in some place where the nickel plating would not wear away.

As far back as 1890 the writer made of this alloy the spacing lever of the Smith Premier Typewriting Machine, and this company have continued to use it ever since, not only for this part, but several others as well. A few years afterward the makers of the Remington typewriter took it up and the writer also made for this company many of the parts of the machine. They have continued to use it and now have their own foundry for its production. The greater part of the carriage and its accompanying mechanism is now made of this copper, nickel, zinc and aluminum alloy, a fact which is sufficient recommendation for its use along similar lines. This company calls it "Silver Metal." Another name by which it has been known is "Aluminum Silver," and it was under such a designation that the alloy was sold for some time.

The various typewriting companies who use this material have always been accustomed to nickel plate it, as it was found that after a time the surface of the alloy became covered with a slight tarnish film, which prevented the machine from having the brilliant appearance that is imparted to it by a white nickel plate. Although this brownish film is only superficial and the alloy does not corrode like brass or similar alloys, yet nickel plating is cheaply done and gives a more lasting appearance to the machine than would be obtained by the alloy alone. When freshly polished, however, the color of this alloy is much whiter than nickel and more nearly resembles pure silver. It is for a base metal that this alloy is suited; when the plating wears away there is left a white, tasteless metal which scarcely reveals itself, so nearly is it like the plating which covers it. Good material that it is on the

typewriting machine, it undoubtedly will find many similar uses in other industries.

This alloy which, in lieu of a better name, let us call "Aluminum Silver," may be really divided into two classes, viz.:

1. The soft alloy, which is in reality German silver, but with its casting qualities improved.

2. The hard alloy and which is, by far, the most useful.

If one desires to make the soft alloy, or better, to cast German silver in sand, all that is required is to add 0.25 per cent of aluminum to the melted German silver, stir thoroughly and pour into the molds in the same manner that is followed with brass. Personally, I prefer to add the aluminum in the form of some alloy of either copper or zinc, as this method of procedure gives better control over the weight, especially if small crucibles are used. If the foundryman desires to make a fifty-pound melt it will be necessary to add two ounces of aluminum; a quantity which cannot be weighed upon the scales usually found in the brass foundry. Such scales usually are sensitive to one pound or possibly half a pound, and the weight of even *such* amounts is far from an accurate operation. The author uses a pair of Robervahl scales for such work and with a set of weights ranging from one-quarter of an ounce to two pounds. They are a very useful and, indeed, an almost necessary adjunct in the foundry where there is occasion for the accurate weighing of small amounts.

The hardness of this soft alloy containing 0.25 per cent of aluminum is slightly greater than that of the same alloy without the aluminum and the shrinkage is a trifle more, but otherwise it scarcely differs from ordinary 18 per cent German silver.

The manufacture of the hard alloy is an operation which requires considerable care if perfect results are desired, and unless the maximum strength is obtained the alloy is unfitted for the purpose intended. For this reason let us get at the very root of the process by which it is made.

As the result of many experiments the author has adopted the following formula as one which gives the best results and, at the same time, is comparatively inexpensive. The proportions are as follows, viz.:

Copper	57.00 per cent
Nickel	20.00 per cent
Zinc	20.00 per cent
Aluminum	3.00 per cent
	100.00 per cent

This formula will give an alloy which is quite stiff, but which will bend slightly in case such a procedure is necessary. If the alloy is desired to be of a degree of stiffness which will not bend at all, increase the aluminum to 3.5 per cent, leaving the other ingredients the same.

If a good colored alloy is desired it will be well to avoid the use of so-called casting copper and select a good brand of electrolytic; lake copper is unnecessary. Any good brand of nickel will answer. As for the spelter, let me say that a good quality of this material is just as imperative as in the case of the copper. Cheap spelter contains considerable lead, which not only detracts from the strength of the finished alloy, if such spelter is used, but also renders it much more easily tarnished. For these reasons a refined spelter should be employed. The purity of the aluminum is not so imperative, although it is better to use a high grade. The 99 per cent grade answers well.

Put the nickel and copper in the crucible together and cover well with charcoal. Nickel itself is very difficult metal to melt in a brass founders' furnace, but if the copper and nickel are melted together little difficulty will be experienced. When the metals begin to melt add more charcoal and see that the metal is kept well covered with it. The ordinary melter is usually quite lax about this and if the surface of the melted metals is left exposed to the air or gases of the fire the quality of the finished alloy generally suffers. When the copper and nickel have melted (be sure that all the nickel has melted, as the small grains in which it usually is sold renders the process of ascertaining this point more difficult than it would be were it in large masses like the copper) add the aluminum. It is not necessary to push the aluminum down under the molten metal but simply put it in the crucible and, of course, its specific gravity will bring it on the surface of the copper and nickel. In a few seconds the aluminum will melt. Now stir vigorously with a stirrer. At this point is one of the peculiar features of the alloy. The temperature of the melted metal immediately rises to a white heat and, indeed, if the copper and nickel were at a bright red heat before the aluminum was introduced, the temperature rises to incandescence. For this reason it is much preferable to have the copper and nickel just barely melted.

This phenomena of the enormous rise in temperature is caused by the affinity of aluminum for the copper and nickel and for this

reason the aluminum should invariably be added before the spelter. If the aluminum is added after the spelter has been introduced the same rise in temperature occurs, but this time it is accompanied by a corresponding loss of spelter by volatilization. In fact, I have often seen the action so violent as to actually eject a portion of the metal out of the crucible. The necessity for the addition of the aluminum before the spelter may, therefore, be readily seen.

After the aluminum has been added and the mass stirred (it is advisable to use a plumbago stirrer) the temperature of the metal is always too high to add the spelter. If this was immediately done the waste would be quite large and not only would a financial loss follow but the strength of the alloy would decrease as well. It is, accordingly, necessary to decrease the temperature of the molten metal before adding the spelter. The best way to do this is to add sprues of the same material which, of course, immediately reduces the temperature to the proper amount. In case the melt is the first one it will be necessary to remove the cover of the furnace and allow the metal to cool of its own accord. At any event, when the proper temperature has been reached, add the spelter and stir well. Immediately remove the crucible from the fire and pour. The writer has obtained much better results as regards strength by first pouring into ingot molds and, after the ingots have set, smelting and pouring into the sand molds.

Patterns should be gated with larger runners and feeders and well filleted. The sand should be worked as dry as possible and the metal poured as dull as the conditions will allow. For ordinary gated work I have found that the metal is at the proper "heat" when spelter fumes are given off freely but not excessively. If the work to be poured is "chunky," as molders call it, just a faint glimmer on the undisturbed surface of the metal shows that the temperature is correctly reached.—Erwin S. Sperry, in *Aluminum World*.

Mixing Iron by Analysis.

Mr. Hill's interesting letter in the February issue of THE FOUNDRY brings forward a matter of great interest to those foundries desiring to take full advantage of scientific methods of mixing but whose output does not warrant the retention of a chemist. In the larger foundries with correspondingly large outputs the matter is readily settled by the installation of a chemical laboratory in charge of a fully qualified metallurgical analyst. Every batch of iron is analyzed in this laboratory and the results passed on to the foundry manager and the mixtures for the various grades of castings calculated from these analyses.

But it is obvious that the small foundry employing few men and with a fairly small output cannot afford to lay down a laboratory and keep a chemist in constant attendance. If for no other reason the small quantity of analyses required does not justify such an action. On the other hand there is not much feasibility in Mr. Hill's suggestion of laying down a laboratory himself and taking up the study of chemistry with a view to analyzing his own irons. In the first place the cost of the apparatus and plant required would be very nearly the same as that for a large works laboratory, and secondly metallurgical analysis is extremely difficult of acquirement; it requires full and wide training together with constant practice before reliable results are attained. Perhaps in no other form of analysis is strict accuracy so essential to good results. Inaccurate results are worse than useless; they lead to confusion and endless worry, often resulting in a condemnation of analytical methods of mixing. It is apparent that however advantageous mixing by analysis may be, it is inadmissible unless the analyses are strictly accurate.

It would therefore seem to the writer that Mr. Hill's best plan is to take up the study of metallurgy direct, specializing in that of cast iron, the literature of which is fairly rich. A study of the effect of the metals and metalloids which in association go to form cast iron will yield information directly applicable to his foundry. Compositions suitable for the various qualities of castings can then be readily got out and the mixing controlled on a scientific basis. All new batches of irons can be readily analysed at comparatively small cost by outside chemists who, of course, must be selected for their reliability.

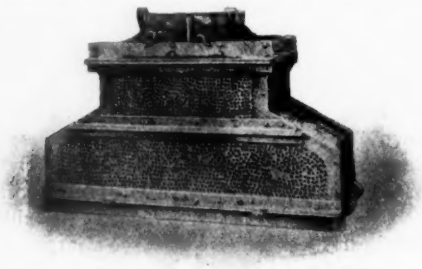
In the case of small foundries this plan is undoubtedly the best, and if the foundry foreman or manager is well versed in the metallurgy of cast iron, competent to fully utilize the analyses supplied by outside chemists, then success as regards mixing by analysis is well assured. PERCY LONGMUIR.

Samuel Davidson, of Fort Worth, Texas, is reported as intending to put up a foundry at that place.

The Minick foundry is a late addition to the industries of Knightstown, Ind.

Molding a Grinder Bed.

The molding of any special casting does not in itself constitute a method which can be followed in molding other jobs, but what proves satisfactory with one casting may occasionally, with slight alterations, be applied to the making of others. It is also reasonable to suppose



THE FINISHED MOLD.

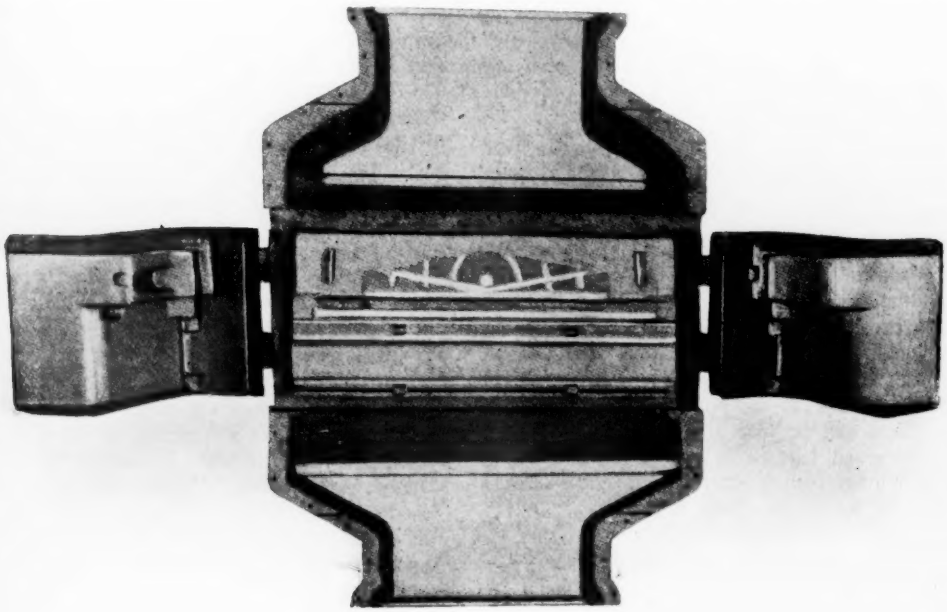
that, while it will not pay to make much of a special rigging for just one casting, where the job is to be made indefinitely, it will pay to provide better appliances.

We illustrate herewith the method adopted by the foundry of the Landis Tool Co. of Waynesboro, Pa., for the molding of a grinder bed used in one of their machines. Formerly this casting was made in an ordinary way with a split pattern when more or less trouble was experienced in producing a mold free from swells and scabs.

Figure 1 shows the completed mold and the external appearance of the flask when closed. It will be noticed that it is thoroughly perforated, which does away with the necessity of venting the mold itself on the sides.

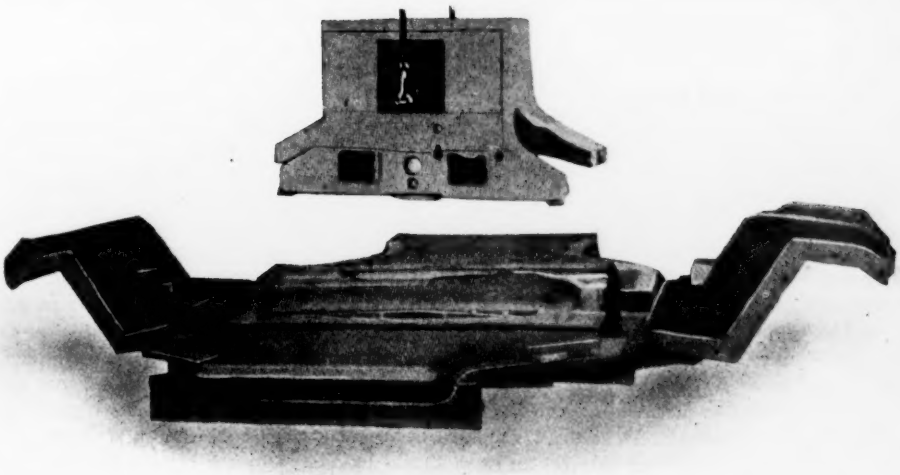
The flask consists of the drag part, two side pieces, which are divided into two sections each, and two end pieces, these and the side pieces being hinged to the drag part. A cope completes the flask. But a small amount of sand is used with this flask, as the latter follows the contour of the pattern.

It is probable that the practical molder, in looking at the illustration of the complete mold for the first time will ask some questions as to how the ends are rammed up. Briefly stated, a dry-sand core is used to form the face of the casting or the bottom part of the mold. This core is placed right on the bottom plate or drag part of the mold, and the pattern on the top of this core. When the pattern is thus placed, one side and the two ends are locked in position,



THE MOLD WITH SIDES UNLOCKED.

the cope placed where it belongs, and the pattern secured so that it will not shift. The flask is then turned over on its side and the two ends rammed up from the side, which is left open. After this is accomplished, the flask is again raised to a vertical position, the cope removed,

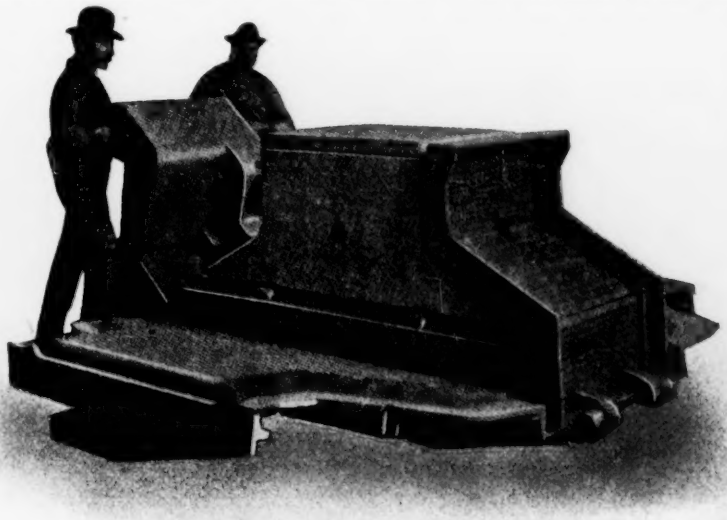


MOLD AND CORE.

and the side of the flask, which was locked in position, let down while a joint is being made in each corner. When this is completed, the lower section of each side is locked in position and rammed up, after which the upper sections are bolted in place and the ramming of the sides finished.

After the cope is rammed up and lifted off, the sides and ends of the mold are unlocked and tilted backwards, as shown in the illustrations, in which positions they are finished. It is at once apparent that every facility is by this method given the molder for rapidly finishing his mold. Every one of us who has had to finish deep molds knows what a back-breaking and uncomfortable position it is to work with one's head hanging downwards.

As stated before, this casting is molded face down to insure cleanliness of its finished surfaces. It is gated through the center of the



CLOSING THE MOLD.

main core, and, as the bottom of the mold is itself a core, there is but little danger of cutting. Not only has the time consumed in molding this casting been lowered by half, but a more perfect casting is produced. In molding such castings on the sides, considerable draft must be given and the matter of getting the core to fit perfectly is sometimes difficult to attain. Molding it by the present method, it cannot help but be true to pattern.

There are two other advantages in the present instance. One is that the pattern does not have to be rapped and knocked out of shape, and will therefore retain its perfect form indefinitely. The other is that the flasks will not have to be pounded to pieces in order to get a casting out, as the sides and ends can simply be let down, when its removal becomes an easy matter.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

WILL THE SHRINKAGE TESTS GIVE ALL THE INFORMATION NEEDED?

"Notwithstanding that I have the highest regard for your system of physical tests and know it is a sure guide to physical conditions, I think that we may in some cases have to resort to chemical analysis to locate the origin of a trouble. The test bars show the nature of this but they will not *always* tell one whether he needs more carbon or silicon."

CUT-UP SURFACES OF CASTINGS.

In the same letter with the above question was the following statement: "Recently our test bars have shown .135 shrinkage and about 400 lbs. strength. At present our bars show a shrinkage of .158 and a strength of 390 lbs. The iron does not flow freely and we lose a good many castings from spongy, dark spots. The silicon in the mixture is about 2.90 per cent and if we increase the silicon we also increase the dark, spongy spots above referred to. Our theory is that these spots are graphite and that the total carbon is not high enough to bring down the shrinkage to its proper point."

Answer. Let me answer both questions at once. The castings referred to are hollow-ware and a piece sent me of one of these shows a thickness of about one-twelfth of an inch, and its appearance indicates that the outside surface of the mold was probably faced and very likely slicked.

The roughness of the surface consists of streaks and patches and in other places of scabs raised slightly above the surface which can be lifted out by a knife. Some of the scars show on both sides of the casting but the center of same is perfectly sound.

For the most part the difficulty seems to be caused by washing of the facing.

I happen to know that this foundry is using a very close southern molding sand. It was formerly necessary in other foundries to mix a fine grained silica sand with this to give it sufficient porousness to vent well. I should therefore say that the sand was rammed too hard at the spots where the surface of the casting is cut and scabbed. The remedy would be to use a more open sand or to open up this sand by adding to it a certain portion of silica sand.

Many foundry troubles can be cured by changing conditions, but it seems natural to blame the coke or the composition of the iron.

We are told that with .158 shrinkage of a one-half inch square bar the strength was 390 lbs. and silicon by analysis about 2.90 per cent, and that a short time before the shrinkage was .135 with a strength of 400 lbs. The silicon to produce .135 shrinkage would be about 3.25. The latter iron would be fluid and well suited for hollow-ware. 3.50 silicon would give a shrinkage of .125 and would be still better

Now referring to the first question. A shrinkage of .158 shows insufficient silicon for hollow-ware, since the *standard* which accompanied the best castings had been found to be .135. This high shrinkage shows exactly what remedy is needed, viz., more silicon. If the carbon is low in the mixture more silicon will be needed than if this element is high, but you can not control the amount of carbon. If your iron is fluid and the shrinkage and strength is *standard* you do not need to care whether carbon is high or low.

If your iron is not fluid and makes dirty castings, be sure that it is melted hot before you distrust the composition of your mixture. If your shrinkage is standard and the iron is fluid and you have scarred castings, look to your facing and molding sand or the ramming of same before you worry about the chemical composition of the iron. "If the test bars show the nature of the trouble" they will likely show it by a high shrinkage, as in this case, which in turn shows too low silicon. The test bars therefore tell you to increase silicon until you get back to .135 shrinkage. A chemical analysis showed you 2.90 per cent silicon,

which is too low, but the analysis does not tell you how much to increase silicon to produce .135 shrinkage and 400 lbs. strength.

If you have sufficient experience to know that 3.25 per cent silicon would produce .135 shrinkage you would have known that .158 shrinkage indicated about 3 per cent silicon and would have increased the latter to about 3.25 per cent so as to get back to *your standard* without having the analysis made. If you do not wish to think of percentages at all, increase the irons that carry more silicon until you get .135 shrinkage.

If you had been making light machinery castings .158 shrinkage would have given you the best results.

The question of strength is another matter. If your shrinkage is what you have found to be the best and your iron is weak you must resort to chemical analysis. When you buy iron you should always ask what to expect as to silicon, phosphorus and sulphur, and I would also inquire whether carbon is above or below 3.25 per cent, and what are the proportions of graphite and combined carbon. You might also ask what amount of manganese the iron is supposed to carry.

With this general information, although not always accurate, you are prepared to manipulate the chemical composition.

If your castings are weak, or to guard against weakness, make your mixture so as to reduce phosphorus until you have the required strength.

Outside of chemical composition you can find a combination of irons that will give you the greatest strength from the shape and interlocking of grains. As silicon opens the grain it is better to keep it as low as possible if great strength is desired.

COMPOSITION OF SMALL CASTINGS.

"Kindly advise us what percentage of silicon, phosphorus and manganese should be in small castings."

Answer. For greatest strength keep phosphorus low, always below 1.00 per cent, and for gears as low as .25 per cent. Keep sulphur as low as possible and manganese about .50 if you want soft castings.

Silicon is the element by which you make a hard or soft iron. The percentage necessary depends upon the amount of carbon present and upon the balance of the composition. When you estimate the amount necessary according to your former experience, as for example 2.75, you must test the casting made from the mixture to see if you have estimated this too high or too low. If you are out either way, change your mixture the next day until you obtain the desired result.

Cost of Fine Brass Castings.

As it has been suggested that my letter on the cost of fine ornamental brass castings (see page 14, March FOUNDRY) was not complete enough in the details of the work, I will try to describe the system followed in the management of this foundry. At the time that we turned out the particular lot of work mentioned in the previous article we employed a foreman, who did the green-sand and snap-flask work, one dry-sand molder, one pattern-maker, whose work it was to gate the various jobs for the snap-flask work, one furnace man, who made cores and attended to the melting of the turnings, scraps, etc., and two boys, who attended the furnaces, arranged sand, did rapping, etc. We pay particular attention to what we deem the main factor in producing successfully cheap castings in this line, and that is untiring attention to the selection or sorting out of the work about to be done, so that the common smeltings will be used for such articles as will not be put to too severe a test in finish or strain, and that the higher class of metal will not be used in the making of such articles as could be made of the cheaper stock. In other words, heavy bodies, chains, etc., many of which are not seen and therefore whose finish possibilities are of no importance, ought to be made of the sweep smeltings; which smeltings, by the way, I have frequently found preferable to some of the so-called yellow-metal sold by some of the smelters, as good material to be used in fine castings. A watchful eye that all this is carried out is necessary.

Now, as regards snap-flash work for this line of goods, I know there are many who will say: "Why, we have tried snap-flask work; it is no good for work that must have a first-class face, unless you can file down or buff down the surface considerably without injury to the ornamentation, and even then the work is not satisfactory. Well, as regards that—admitting that as a rule the work is not as good as dry-sand work, as far as fine surface results are concerned—there nevertheless is a large percentage of the work that can be made with face little inferior, as it must be tooled considerably after coming from the foundry, whether made snap or dry. Here again comes into play careful selection. That snap work is more cheaply produced than dry is of course

conceded, therefore we take care not to make work in dry sand that will turn out satisfactory in snap.

For our snap work we use Windsor Locks sand only. We have tried others, but have found none so good as this, and to the credit of this style of molding will say that we have turned out pieces in snap the equal of dry-sand work in every particular; and, as molders know, there are some things that go better green than dry. Of course I do not mean that there are any ornamental pieces that cannot be made in dry sand, but it is not every dry-sand molder who is an expert, and frequently it is found easier for the ordinary molder to resort to the green method than to try it dry again. All our work that must show a fine face is of course made in dry sand, and all pattern work is made in dry sand. Our cores for slender arms are made with open, porous sand; frequently without wax tapers, as we find in some of our cores little space for sand if wax tapers and wires are used. We also use plaster core boxes when there are not a great many pieces of a kind to make and when it is possible to get along without special driers for the cores.

I believe that the low figure obtained is only on account of the careful selection or sorting out of the work, so that as much as possible is made by the snap molder without, of course, injury to the finer class of work. I might add that since the last figures given we have turned out a month's work of 6,000 pounds at an even lower cost than the cost per pound shown by me in my former article.—John G. Niederer, in *American Machinist.*

Watch the Apprentice.

I have read with considerable interest an article in the February issue of THE FOUNDRY, written by E. C. Wills, in which he encourages the apprentices to watch what is going on around them in every department of the shop. He urges the young molder to become acquainted with the best men in the shop in order that they may through contact absorb some of their good qualities.

Perhaps it would not be altogether out of place to invite the molders and other people connected with the foundry to watch the apprentice. On general principles we all acknowledge that it becomes the moral duty of the employer to exercise a watchful eye over the young men who enter the shop for the purpose of learning the trade. When one chooses our groveling occupation for his vocation he should be regarded respectfully and due consideration should be shown him. The trade in general can be made just as dignified as any other and is capable of yielding as much solid satisfaction to those engaged therein as any other industry.

It is safe to assert that in the majority of cases the boys who come into the shop to learn the molder's trade are at the time good boys, studious and willing, and we are anxious to teach them all we can. Of course in nearly all foundries there are unfortunate conditions which tend to poison the youthful mind and reduce the number of boys who continue to be good. Yet the foundry is no worse in this respect than any other trade. As these young men proceed in the trade they develop into two classes, the first possessed of the determination to become as good workmen as it is possible for them to do, while the second class is a collection of those who are contented to shove along any way and always watching and whining for six o'clock to come. Now the latter class are surely objects of pity for they have a hard road to travel, and it is too bad that they should have selected our trade for their work. To them it must indeed be drudgery, it can not be pleasure. As Mr. Wills exhorts the apprentice to choose the good workmen for a pattern, let me ask those engaged in the trade to solicit the friendship of the boy who is bright enough to inquire into everything he sees going on around him.

It is even possible to admire the perseverance of the boy who will good-naturedly, yet earnestly and persistently, demand an explanation of any shop proceeding. It has been my pleasure to be at the head of a small shop a number of years, during which time quite a number of apprentices have come and gone, some being a credit to the trade, others failing to make a success of it. Among the number was one who from his very entrance into the shop showed every indication of his intention of becoming a good workman. I cherished and respected him and he displayed an ever increasing interest in his work, which heartiiy agreed with him and consequently he made rapid progress. We grew to understand one another and made fast and real friends. On one occasion I was inclined to put his interrogations off slightingly without revealing fully what he most earnestly wished to know. At this point he taught me a lesson when he reminded me of the fact that I was his teacher and he my pupil, and that it was my duty to explain. Confidence of that kind is complimentary.

Then show respect for the straightforward

boy who has enough of forethought to use up every hour of the day in storing up knowledge and gleaning information from every attainable source. Such a boy can generally be counted as a friend and one who will never cause disappointment to any of his instructors. He will be a credit to his foreman and an honor to himself and satisfactory in every particular to his employer. There are such boys in all foundries; let us follow them along, interest ourselves in their welfare, sympathize with them. Watch them. JOHN B. SHAW.

A Cheaply Made Skimming Device.

Several patents have been granted for self skimming ladles, though none of these seem to have attained any great degree of popularity. One American patent shows a metal partition inside the pouring lip of the ladle, extending to very nearly the bottom of same, having an air space in the center and its outside lined with a refractory material. There are also German and English patents covering substantially the same design, all of which have secured but little attention.

There are but few molders who have not at some time or another tried to devise a successful skimmer for their ladles. Some have tried a perforated wrought iron plate, or a cast iron plate having points to hold the lining in place. The trouble in such cases has been that when a ladle is filled with metal the plates expanded and tore off the lining.

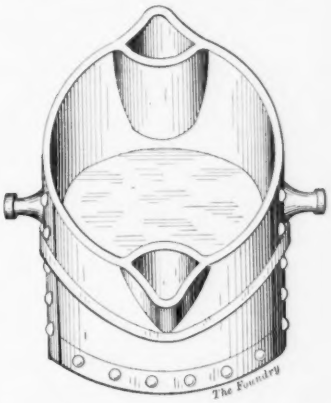
There is but little satisfaction either in using a fire brick for the purpose of obtaining a self skimming ladle, for, as a rule, this will break when submerged in melted metal for any length of time. Aside from this it is a nonconductor of heat to a very large extent and has a tendency to chill the metal which comes in contact with it, which really makes it useless for a skimmer.

A couple of years ago, while having charge of a foundry in a New Hampshire town where we were turning out a large amount of castings which had to be very clean, we did not have men enough to do the skimming and something had to be done to remedy this.

At that time I took from the brass foundry dump some old discarded crucibles, split them into sections of the proper size and put these in the ladles for skimmers, as shown in the illustration. That settled the skimming question for me and I have had but little trouble since to satisfactorily skim the metal.

These skimmers require no changes in ladles or lining, as they are easily held in place until the lining is completed, when this will hold them in place.

One of these discarded crucibles will last from 150 to 200 heats and will save much of



A CHEAPLY MADE SKIMMING LADLE.

the labor usually employed to skim iron. Pouring nothing but clean iron from the ladles the use of skimming gates in the molds will also become unnecessary. It is not essential that these skimmers should extend down into the ladle to any great depth. A little practice and good judgment will show anyone just what is necessary. As the old crucibles are usually discarded the cost of these skimmers may be said to be nothing.

With this skimmer in use it is impossible for scoria of any kind to leave the ladle, as all of these impurities will rise to the top while the metal is drawn from underneath the surface. P. BURKE.

Rochester, N. Y.

Winning Prizes in the Strawberry Belt of Michigan.

Eight months ago Earl Evans came to Benton Harbor from the farm and began work in the foundry of the Cameron, McKay Co. He has made a good record. The secret of success with an expert molder is to cast perfect work. There is always a large amount of castings that have to be thrown away on account of imperfections. Two weeks ago Evans made a great record and Manager Bidwell offered a $5 prize to any molder who could beat the record made by Evans. Last week Evans beat himself and earned the $5 prize.—Benton Harbor (Mich.) *News.*

Alfred Congdon of Hancock, Mich., will hereafter have charge of the Hodge Iron Co.'s foundry at Houghton, Mich.

Operations in Machine Molding.*

It is, undoubtedly, a highly interesting study to follow the various branches of molding and casting into their details. For instance, to observe how intricate white metal objects are made by chilling a thin layer of the fluid material in the mold, then pouring out the liquid interior and thus producing hollow vessels of the most difficult shapes; or, to see how hollow rubber goods are made without any opening at all in the object, by enclosing a drop of water within a lump of the plastic mass, then causing the water to expand, thereby enlarging the cavity and forcing the material into the finest engravings of the surrounding mold. But all this would lead us far astray from our present subject, and as far as may be, we shall confine ourselves in the following pages strictly to the process of sand molding.

It is well known that it requires long experience and exceptional skill to produce the large variety of castings in iron, steel, brass, bronze, or aluminum in sand molds, and it is understood that even these branches of the founding business are divided into numerous sub-branches, which are in the hands of specialists. No foundryman would expect a molder to be equally good on hollow ware, stove castings, light or heavy machinery castings and ornamental work. It requires a most skillful mechanic to master any one of these branches successfully. Let us but look over the long list of patterns and over the large variety of shapes, which come under the heading of each class, and we will no longer doubt that the constant changes to which the molder has to adapt himself require at least good judgment on his part.

On the other hand, we must admit that this is not true in all cases. All castings are not intricate. Some shapes are exceedingly simple; in a great many instances the same pattern has a long continuous run, then again many foundries produce articles which are frequently duplicated in considerable quantities; while there are others working on specialties which are making only one kind or one class of castings year in and year out. These are but a few of the many instances in which the same operations are constantly repeated, where the same manipulations are gone through over and over again, in the end becoming not only monotonous, but often distasteful to the skilled mechanic. In fact, his services are generally dispensed with in cases of this kind. His skill can be and is employed elsewhere to better advantage and to the better satisfaction of both parties. Such work, therefore, is turned over to selected foundry laborers.

It is the natural tendency of all foundry owners, superintendents and wide-awake foremen, to increase the production of their foundries with the least possible expenditure; and therefore less experienced men will gradually be entrusted with work which becomes more and more difficult to perform. Mechanical means and contrivances are frequently resorted to, to encourage green hands to expedite matters, and to insure success. All such labor-saving devices are especially designed for the purpose of insuring a larger output, and to obtain more uniform, better, and cheaper castings, and in some degree to take a part of the responsibility from the molder, and shift it upon the shoulders of the patient pattern-maker. But while such mechanical means are almost a necessity in the hands of less experienced men, they are none the less a great convenience and material help to the expert molder.

To commence with the simplest of all labor-saving devices for molding, we must take up the loose gate or runner. This is placed on the mold board, next to the pattern and rammed up with it. Its advantage is evident in saving the hand work necessary for cutting the gate in the sand. In some instances these gates are directly connected to the pattern, forming one piece with it, thus saving the separate lifting of it out of the sand. Two or more patterns are frequently secured together to form a gate; sometimes, especially for small castings, a dozen or more patterns are thus fastened together. Many molders prefer carded patterns, i. e., patterns fastened to a plate, to the usual gated ones. They have undoubtedly an advantage over the latter; they are stronger and they can stand more abuse.

It is sometimes more advantageous to use two independent plates for one set of patterns. If this is the case, one of them will be used for the drag side and the other for the cope side of the patterns. Should these two plates be held or secured together, with their backs adjoining, they would be practically the same as the above mentioned cards.

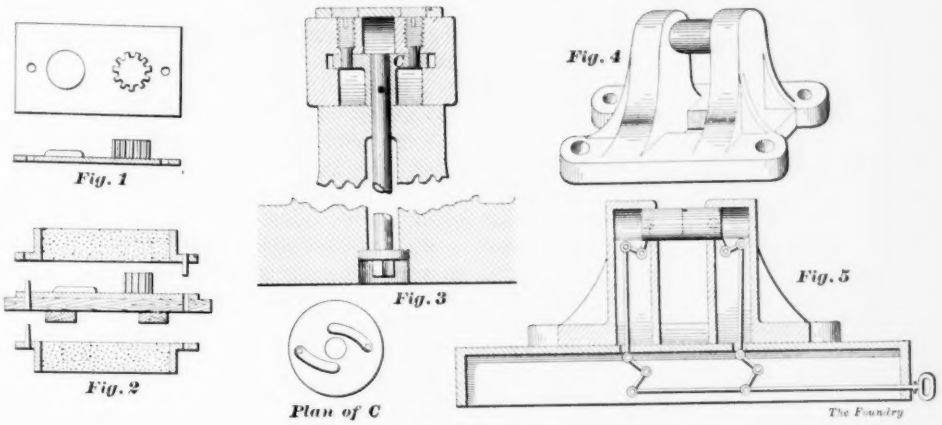
Match plates should be used with gated or carded patterns, to insure satisfactory working. They are rarely necessary when the patterns are placed on one side of the plate only. Using the face of a straight mold board as a bed for the plate to insure molds true to pattern will be found sufficient in most instances.

*S. H. Stupakoff in Journal of American Foundrymen's Association.

By working each half by different men, double the quantity of castings can be produced in the same time, with patterns arranged in this manner, than when gated or carded. But it requires a set of carefully prepared flasks, which are especially fitted to the plates, to enable their use and successful application.

A pair of plates can be produced without much difficulty by first drilling the full patterns at right angles to their parting faces for the necessary dowel pins or screws, then placing the two plates back to back together, inserting accurately fitting flask pins into holes

Let us assume we have the pattern of a pinion with a flange on one of its sides. Ordinarily, we would leave the flange loose, place the toothed portion of the pattern on a mold board, ram it up in the drag, then turn over the drag with pattern, put flange in place, ram up the cope, lift off cope, turn it over, withdraw both parts of the patterns, and finally close the flask. When plated patterns are used we make two pinions as described in one flask, by securing the toothed portion and the flanged portion separately, but exactly in alignment with each other and at equal distance



OPERATIONS IN MACHINE MOLDING.

provided for them therein, and suitably arranging and clamping one-half of the patterns on their upper face. The holes drilled previously into the patterns are then used as jigs or guides for a drill to drill corresponding holes through both plates, and the lower halves of the patterns will match with the upper ones if secured to their respective positions.

The shape of the patterns often permits them to be molded with either side in the cope or in the drag. When this is the case, they can be advantageously secured to one side of the plate only, and the same plate, or rather the same side of the plate, is then used to produce both cope and drag.

Patterns prepared in this manner belong to a group possessing radically different characteristics from those of the foregoing. The nature of this arrangement involves some intricacy, and to insure good castings the application of the patterns to the plates demands the utmost accuracy and greatest care at the hands of a skilled mechanic. A simple illustration will best serve to explain this subject.

from the flask pin holes on the same face of the plate, as illustrated in Fig. 1.

Thus prepared, the plate is placed on a mold board, a portion of the flask placed over it and rammed up with molding sand, and naturally we will get an impression of each of the patterns in the same part of the flask. The same process is then repeated with the second half of the flask and the same impressions are obtained in this one. Now, in placing these two portions of the flask together, it is only necessary to observe that the cope is turned in such a manner that its flanged portion will cover the toothed portion of the drag and vice versa. To avoid possible mistakes of this kind, each portion of a flask has only one pin which fits in a corresponding hole of its mate. The mold board is provided, likewise, with one pin and one pin bushing and carefully fitted to plate and flasks. Fig. 2 illustrates the relative positions of the cope and the drag, the plate with pattern on the mold board is shown directly under the cope, indicating their relative positions directly after lifting off.

The advantage of this method of molding

over the ordinary practice is apparent. It insures double the output with the same number of patterns and the same expenditure for labor. Good patterns with plenty of draft are easily withdrawn from the mold by carefully raising the plate; more or less rapping is necessary if patterns have little or no draft, or if their shapes are complicated. The rapping of the plate itself must be avoided; it is of little or no use if it fits closely to the flask pins as it should, and in all cases it will have a tendency to damage not only the plate but also patterns and flasks. This suggests the use of a double plate, one of them a stripping plate, which lies nearest to the face of the flask, and the second one a draw plate to which the patterns are secured. If held together and guided by independent pins which can be located outside the frame of the flask and move in bushings which should be closed above, we have a serviceable inexpensive substitute for the molding machine. In fact, as a hand operated device, it is undoubtedly a very close approach to the more elaborate and more expensive molding machine.

While in the foregoing only straight plates have been described, it should be noted that these are not always suitable. Patterns cannot always be parted in straight lines, or, correctly speaking, in planes. Parting lines may consist either of broken straight lines or of curves, or they may be composed of a combination of both. It is obvious that the surface of the plates should correspond with the parting lines of such patterns, if they are to be plated. Sometimes there are good reasons to make the underside of the plate follow the shape of its upper surface, especially when the deviations from a plane amount to considerable depths, while in other instances when shallow—it may be preferable to make it in a straight plane. Plates with irregular undersurface must be used in connection with suitable match plates or match boards.

Other conditions may recommend the placing of one portion of the pattern above and another portion below the plate, especially when castings of hollow cross sections are to be produced. Plates arranged in this manner are practically pattern and match in one piece. These have the advantage that straight plates can be used in place of irregular shapes. Irregular shaped plates are always expensive. For this reason alone, if for no other, they should be avoided, if possible.

Matches, when used in connection with plated patterns, may be temporary or permanent. Temporary matches are made of molding sand in a flask belonging to the set fitting the plate. Permanent matches are made of oil sand, plaster of Paris or wood. They are always preferable for a continuous run of work. Frequently, if made of wood, they take the shape of a match board, or box, with certain portions cut out of it to permit of a protrusion of such parts of the patterns which extend beyond the undersurface of the plate.

The plates referred to in the foregoing embrace nearly all variations with fixed and stable patterns which are in general use in our foundries. But before disposing of this subject we must mention as a class, distinct from the above, plates with movable patterns and plates with movable portions of patterns, which may be well termed and classified as mechanical pattern plates.

Many patterns have projections which make their withdrawal from the sand impossible without extra operations. Such projecting portions are usually secured loosely to the pattern by dovetails or dowels, and arranged in such a manner that they will remain in the mold when the main body of the pattern is lifted out of it. They are then picked out separately, and great care must be exercised by the molder that his mold is not being destroyed while he accomplishes this operation. This is always a tedious and costly manipulation, and gives just cause to the fervent wishes and sincere recommendations of the molder (always expressed in the strongest possible language) that the designer of such patterns should be compelled to serve a just and legal time as apprentice in a foundry.

When such projections cannot be avoided, these obstacles to molding can be quite frequently overcome by withdrawing them within the patterns by suitable mechanical means, before the main body of the pattern itself has been removed from the mold. Single patterns can be equipped in this manner, but especially when metallic and plated patterns are used, such an arrangement is oftentimes advisable, and its application in practice will give not only satisfaction, but it will prove to be of advantage to the manufacturer and a desirable convenience in the hands of the molder.

Fig. 3 illustrates a simple device for withdrawing in a single operation two projecting hubs sideways from the sand into the body of the pattern. The hubs are fitted into a corresponding recess of the pattern and each is provided with a screw or pin which reaches into a slot cut at right angles to its axis. In the

slot lies a disc with cone-shaped openings which receive the ends of the pins or screws. A shaft is driven into the cam disc and reaches through the pattern to its face. A rotary motion can be imparted to the shaft by applying a socket wrench to the square at its lower end, which in turn will act upon the pins of the hubs and move them inward or outward as the case may be. It is obvious that in this manner projections can be picked out of a mold at a depth and within a space which would be quite impossible if attempted by hand.

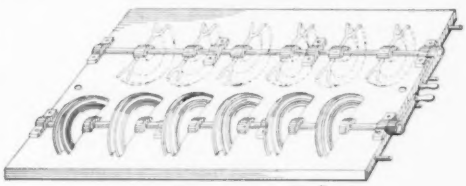


Fig. 6 The Foundry

OPERATIONS IN MACHINE MOLDING.

As an example, Fig. 4 illustrates a casting with similar features, and Fig. 5 gives the cross section of the pattern for this casting secured to a plate, with an arrangement which will accomplish the desired object.

Plates, when properly equipped, are also admirably adapted to withdraw the entire pattern from the mold, before the flask is being lifted off. This arrangement is especially valuable for molding wire sheaves, pulleys, discs, wheels and similar shapes which, when revolved around their center, will permit of their turning out of the mold. Fig. 6 shows a device of this kind equipped with patterns of webbed chain sheaves, part of them being in the position they would occupy in the flask while molding, and part of them being withdrawn.

Such a device, though merely a plate with movable patterns, is practically a stripping plate molding machine in the fullest sense of the word. In fact there are few of the many elaborate designs of molding machines more perfect, more effective and more seviceable than this. Its application, however, is limited; it is little known and rarely used. It is costly to produce, as it requires exceedingly careful workmanship, and an equipment of flasks which must be kept in excellent condition to insure perfect castings.

All plates, as described, are used with good advantage independently, but they can, without any alterations, be used equally well in connection with molding machines, and in most cases they are actually one of the principal parts of them. There remains to be considered to what extent plate molding is to be recommended for adoption in our foundries, and to summarize the principal advantages which it presents over ordinary hand molding. The following deductions are made from the foregoing explanations:

Plated patterns give the best service when used continuously.

Castings which are to be produced in quantities are preferably molded with plated patterns.

Standard patterns are preferably plated for economic production in the foundry.

When plated patterns are used, good flasks only will insure good castings.

Accurate workmanship is one of the main requisites in plated patterns.

Plated patterns should be made of metal to give good service.

The use of wooden patterns on plates is not excluded.

All patterns when placed on plates should be provided with plenty of draft.

Plated metal patterns are preferably made hollow.

Rapping is destructive to plates and plated patterns.

Economy of Mixing Iron by Chemical Process and Removal of Barriers to its Adoption.

When the advantages and economy of mixing iron by chemical analysis was first advocated, it was thought, by many, to be either a fad, an impractical theory, a method that was beyond a founder's comprehension, or if practical, so expensive that few, if any, could afford to adopt it. Aside from this, there were many things which made the science of chemistry so unreliable that the few believing in its utility often found themselves bewildered and misled in trying to utilize it. One of these factors consisted in chemists not being able to agree in their analyses of the same sample. This evil was greatly overcome by the introduction of the American Foundrymen's Association Standardized Drillings, which enable chemists to test their work by a standard which proves whether they are correct or not.

Another evil lies in the chance of clerical errors, etc., in shipping iron from the blast furnace. This can only be provided against by founders re-analyzing their pig iron upon its receipt into their yard. This is not saying that all furnace analyses are incorrect, but if only one in twenty proves so, it is sufficient to cause most founders a loss that would more than have paid

for the re-analyzing of every car of pig iron. Founders of long experience in working by chemical analyses know well the advisability of re-analyzing their pig irons. If a seller knows that the analysis furnished with his iron is to be checked before the iron will be accepted, he will be a great deal more careful to avoid errors. I know some will say that at the present day the demand for pig iron is such that they cannot hold iron long enough in cars or their yards to obtain analyses. This is true in many cases; nevertheless, if it is known that a buyer is in a position to, or has the habit of ascertaining what is being furnished him, he will command greater attention from the seller. My experience is such that I feel I cannot say too much to impress founders with the importance of re-analyzing all their pig irons if they desire to have chemistry in making mixtures a success.

The class of founders to be benefited through the aid of chemistry includes especially, those making light castings in gray iron, calling for special qualities, or which are to be finished and fitted in a machine shop, also castings requiring chilling or certain grades of hard iron.

Since it has become an established fact that fractures of pig irons are too deceptive to be used as a guide in grading it, to make mixtures, the large number of founders now working by analysis will be gradually increased. However, there are many who require counsel in order to convince them that they are in error in not working by chemical analysis. Almost all of the latter class can have a dozen or more excuses, other than blaming the iron, when they fail to obtain the softness, hardness, chill, etc., they desired in their castings.

The difference between working by analysis and judging fractures of pig iron lies in the fact that, with the former, it is possible to attain a uniformity of results in obtaining desired grades that cannot be secured with the latter under any condition, no matter how extensive the experience. We will first take the case of two light work founders, one following the old school methods and the other the new. With the former, few heats are alike in softness and very often half or more of a whole heat of castings is lost through fault of the iron being too hard on account of its chilling qualities, or brittle by reason of being too soft, whereas the latter can go on day after day obtaining very close uniformity, and what difference may exist being insufficient to seriously affect the castings or cause any loss. It is to be understood that the new school founder when he desires to take no chances utilizes chemistry to test his coke as well as his iron.

We next have the founders making medium and heavy machinery castings that not only require certain qualities, as to strength, uniformity in contraction, etc., but considerable finishing and fitting in the machine shop. Here is where those following the old school methods of making mixtures by judging pig iron fractures find themselves continually called to the machine shop to answer why such and such castings are so hard, it often taking from one to four times as long to finish and fit them as it should. Again, he has trouble assembling different parts that do not fit as they should, on account of unexpected difference in the contraction of the castings. It does not require many hours of unnecessary work in finishing and fitting castings in the machine shop, caused by one or two heats a week not giving desired results, to pay for analyses that would have insured obtaining desired results for a whole month's run.

The next in order is founders making certain grades of hard or chilled castings. This class has the least margin for variations in obtaining desired results. Gray iron castings may often vary greatly in their degree of hardness and by extra labor and expense in finishing or fitting be made to pass, but hard or chilled castings must, as a rule, come closely to a certain desired standard or be condemned. No amount of labor expended upon them after they are cast can save them. In making this class of castings very delicate points in degrees of hardness, depth and character of chill are sought for and such can be obtained, day after day, by utilizing chemistry, but by no other means. I could continue at great length to illustrate the great reduction of expense and worry, and the gain of trade that is obtainable by the founder adopting chemistry in regulating his mixtures, but will say no more on this point at present.

In an article on page 50, of the April FOUNDRY, I described the injury that is being done the trade by the exorbitant prices asked for analyses, and by the advocacy of impractical practices. By the latter, I refer to physical tests being depended upon to regulate mixtures, a method that "locks the stable after the horse is stolen." There are certain conditions under which physical tests are commendable, but not for the work referred to above. Physical testing, to wholly regulate mixtures

and, in many cases, as an assistant, is being constantly abandoned, especially by light work founders where the best test is the casting itself, as most light work founders have some bad castings in every heat that can be broken to test their character to show the mixture used, or, if good, can be told by the test of grinding, fitting and filing, better than by the contraction, strength, or chill of test bars.

Founders are coming more and more to rely wholly upon chemical analyses to regulate mixtures, but have been greatly retarded in its adoption by reason of its cost. As a means to decrease this cost so that founders not in a position to support a laboratory can obtain reliable analyses at the lowest or most reasonable cost, and encourage and greatly extend its adoption by founders, I proposed in the April FOUNDRY to organize a stock company laboratory. It is evident from letters received and visits of prominent chemists to discuss the subject with me, since the appearance of the above article, that a great interest has been awakened in this subject, and all express themselves as believing it to be a movement in the right direction. The chemists who called upon me advanced arguments that it would insure better service to customers to labor for an increase of trade for the laboratories already established and catering to foundry business, and that the work could be done at as low a cost by these individual laboratories as by a stock company, as, in either case, the reduction of costs would depend upon the volume of business transacted and there was little doubt that founders would much prefer to avoid the first cost of $20 for a share in a stock company and pay only for the actual work required, at rates closely uniform to those proposed in my last month's article. Believing that the ground taken by these chemists is correct in many ways, I have decided to defer the plan of starting a stock company for the present and give the existing laboratories who have agreed to reduce their charges a chance to show what they will do to place chemical analyses within the reach of all, and encourage founders never having utilized chemistry to analyze their irons and fuels for a trial. I venture the statement that any who will start and be guided properly by analyses will never dispense with their use as long as they can obtain these at reasonable prices.

Any founders requiring information as how to obtain samples of their iron or fuel to be analyzed, or how to use analyses when received, in making mixtures, I shall be very glad to assist through correspondence to the best of my ability, and entirely without charge.

THOMAS D. WEST.

The Krank's Korner.

We hear a great deal nowadays about scientific founding, progressive molding and modern foundry practice and that we have no monopoly of these things on this side of the universe is shown by the following, for which an English contemporary stands sponsor:

"There are probably few foundries in which such excellent practice is made as that which obtains at the Millfields works of S. Thompson & Co., Ettingshall, near Wolverhampton, where castings of every description, from tiny shelf-brackets to structural castings of 5 tons weight and more are undertaken, and every process is carried on on a scientific basis. Particular attention is paid to the preparation of the cupola charges, the pig iron as it comes into the yard is carefully tested and graded, and the same with the scrap, with the result that the firm are able to use raw materials such as would be unworkable by ordinary rule-of-thumb methods, and to achieve results such as would otherwise be unattainable. Take, for instance, bath-tubs, and considerable difficulty has been experienced hitherto in casting work of this description with Staffordshire iron, but Messrs. Thompson are able not only to produce baths from such metal, but they are able also to cast them much thinner than is usually the case. The cupola is of modern type, and is admirably managed, and, although the firm are blowing all the day long, one never sees a great body of flame shooting up into the sky such as is all too generally the case. The foundry proper is equipped with numerous labor-saving devices, including a hoist, designed on somewhat original lines. This lift, which travels the whole length of the foundry, is manipulated entirely by hand from the floor, the traveling, racking, and hoisting being effected by means of the same crank-handle, the various operations being controlled by a quick-change gear."

Now here is a shop where everything ought to be lovely. Wonder if it is?

* * *

"Why should there be a difference of 100 per cent between the wages of the common laborer and the wages of the molder?" asks our friend Putnam. Probably if he will try to have them work at the same rate he will find the answer. There is nothing like doing

a little experimenting in such cases instead of asking so many foolish questions in the newspapers.

We are also informed from the same quarter that the supply of unskilled laborers is greatly in excess of demand. Such may be the case around Moline, but if so there is something wrong with that neighborhood.

The iron and steel industries of Pennsylvania and Ohio will be glad to take care of all the able-bodied laborers that town can furnish. We know of several foundries that are looking for men with the sole qualification of having enough muscle.

* * *

The town of Indiana, in the state of Pennsylvania, has two foundries, the Clymer Mfg. Co. and the Indiana Foundry Co. According to the *Gazette* of that city these shops must be doing a heap of good for the foundrymen in their vicinity, as will be seen from the following: "There is hardly a foundry of prominence within two hundred miles of Indiana that does not employ one or more journeymen molders who have learned their trade in Indiana. The local foundries are continually in receipt of inquiries for good men to fill important positions where pay ranges from $2.50 to $4.00 per day. The reason is because this always lucrative trade is learned to the best advantage in foundries such as we have in this place, where every kind of casting from a plow point to a complete stove or intricate cog gearing is made. The all-around, skilful molders the foundries here turn out need never be without a job at big wages. Our foundries are not only willing, but anxious, to give a start to worthy boys or young men who want to learn the business. In fact, for the past year applicants have not been numerous enough, as they are working up to the utmost of their capacity and have always an opening for honest applicants. No man or boy who is willing to work and has mastered the molding trade need worry over his future, for no class of skilled labor commands a better price, or is in greater demand."

When you run across anyone who would make you believe he is a molder, when he is only half baked, send him to Indiana, Pa., to finish his education.

* * *

M. H. Treadwell & Co., who operate a foundry at Lebanon, Pa., have issued a little folder which gives the following formula for "sure success:"

30 per cent, Patient, persistent dig, dig, dig, at it every minute.
30 per cent, Reputation (founded on fact) for honest dealing every time.
10 per cent, Luck and fortunate circumstance caught on the fly.
20 per cent, Snap.
10 per cent, More persistent dig.

100 per cent—SUCCESS!

According to this program success is only attained by furnishing 40 per cent of persistent digging.

Now I am sure this prescription does not apply to our foundries, although it is founders who advocate its use.

Some of the most persistent diggers I know have been digging for years. Maybe they have earned ten cents or so a day more than the balance of their fellows. They have had to spend this much to provide increased horsepower. So where have they gained anything?

When it comes to selecting a foreman, does the old man pick out the molder who can put up the biggest day's work? Does he give the job to your persistent digger, the man who keeps his nose in the sand pile till the last minute? Very seldom does he do so. As a rule he is more interested in finding a man who can jolly others into digging, than he is in finding a real digger.

I know owners of foundries who have worked hard for a decade and have nothing to show for it. They have worked far harder than any man in their employ. And alongside of them are other foundrymen who never have breakfast until eight o'clock and are able to spend their summers at health resorts.

All of which makes me think that while 40 per cent of digging may be all right, the digging must be done in the right direction. One may dig hard enough only to find perpetual failure.

* * *

One seldom sees an old molder and it is something out of the usual course to find one who has worked fifty years at the trade. This distinction, however, falls to Patrick Trainor, of St. Johnsbury, Vt., of whom a local paper says:

"Last Saturday when our esteemed townsman, Patrick Trainor, closed his work at the scale factory foundry and transferred his floor to his successor, it marked the close of 53 years of faithful and continuous work in the Fairbanks shops. During most of the time since he completed his trade Mr. Trainor has

done contract work, and many molders here and in various parts of the country today learned their trade with him. It is no small compliment to the faithfulness and ability of Mr. Trainor that he held so good a position for more than half a century, and neither is the praise that he bestows on the Fairbanks company for their treatment of him during all these years a thing to be considered lightly, for this matter of kindly relations between employer and employe has done more toward making St. Johnsbury what it is today, perhaps, than any one thing."

Fifty-three years' continuous service in one foundry is something of which one may well be proud, and incidentally it is also a great compliment to the management of E. & T. Fairbanks & Co. to be able to retain their workmen for such long periods.

* * *

J. Fred Zeller, of Cincinnati, Ohio, can also point to a good record in twenty-seven years' service with the Eureka Foundry Co., twelve of which he has spent as foreman. Mr. Zeller recently resigned his position with the Eureka foundry to establish the Sterling Foundry Co., which will have the following officers: President, J. F. Zeller; vice-president, J. George Zeller; secretary and treasurer, G. J. Heinzelman.

* * *

Manila papers give information concerning the largest casting ever made in the Philippines, which was lately cast in the new foundry of Earnshaw & Co., and weighed three tons. In the description of the plant we find the following:

"The foundry is equipped with perfectly new and modern apparatus, and the chief feature of the plant is its compactness. The capacity of the foundry is about five or six tons of castings a day when a full force of fifty molders are employed. The furnaces are what is known as rapid receivers of the improved type, fed with coke and driven by blast, and the foundry is fitted with cranes, hoisting apparatus for conveying the ladles of metal to the different molds and everything complete and up-to-date. There is also a brass furnace capable of melting a thousand pounds an hour. To provide against any emergency through the supply of special sand which is used for the molds running out, the foundry is equipped with coal, coke and stone mills for the production of this article. The foundry is under the management of C. A. Johnson and is complete in every detail and the workmen are provided with excellent quarters on the premises."

Evidently those fifty Philippine molders will take it easy if they are going to be all day turning out five tons of castings. We suspect that an extra cipher has slipped into the capacity of the brass furnace. However, remember, this shop is far away, and if we were there we might not be half as modest in the use of figures.

* * *

Chas. Hornbostel, of New York City, has a patent on a "Perfect Combustion Process" by ozonized air blast, granted Oct. 2, 1900. A leaflet dealing with the process says that "it is carried out by forcing a current of air on a compound of permanganate of potash and sulphuric acid, which is placed for this purpose in a compartment connected with the air discharge of the blower fan, or air pump, which may be in use, by a pipe extending downward into within a certain distance (equal to about 1⅓ of this pipe) from the bottom of this compartment; the ozonized air is taken off from the top and led as ordinary to where applied for use.

"For a trial of the process, the chemical compound is so prepared that on dropping it through the side air-intake of a Sturtevant or similar blower, it will stay on the bottom and here be acted on by the air, when the blower is set in motion, without being blown away and without doing the least injury to the blower and pipes. For a Root or similar blower, a flat pan, containing the chemical compound, is placed underneath the air-intake, in such a manner that when the air is drawn in by suction, it is forced over the chemicals. For a steam-jet blast a similar method is applied."

My friend Hornbostel does not confine his claim to doing good to the foundries only, but takes in blacksmiths' forges, blast furnaces and steam boilers. In the foundry the "Process" "never fails to make your casting softer and stronger." In the blacksmith shop it will "weld iron and steel to steel without a flux in a clear intensified heat." And so it goes, only the majority of those it is supposed to benefit seem to refuse to take advantage of it. For making castings Mr. Hornbostel puts up some strong claims for the ozonized air in the following:

"The ozonized air intensifies the heat and converts the sulphur in the coal or coke into a state (anhydrous) in which it no longer combines with the melted iron. It is this freedom

from sulphur and the increase in the temperature in the cupola, which cleanses the melted iron and makes much softer and stronger castings of a closer and more uniform grain.

"Castings may be made to cost less, and still be soft by reducing or leaving off entirely the expensive pig iron, high in silicon, used for making soft castings like stove plates and small ware. Scrap and cheaper grades of iron will make soft and strong castings, which in planing, drilling, filing, etc., save tools and time."

All there remains for Mr. Hornbostel to do is to substantiate these claims by facts and it won't be many years before he will be able to have a coachman at his command. It will be recollected that other "Processes," notably the Doherty, have claimed to do nearly all of these things and sadly failed when the evidence was demanded.

The "Philosophy of the Hornbostel Process" will be found in the paragraph below, and I turn this over to our scientific founders without comment:

"No new substance is formed in the reaction of the chemicals employed, as this is the case in chemical processes generally, and naturally would be looked for. This process is purely of a catalytic nature, in which the oxygen undergoes condensation, without that the chemicals undergo any chemical change. In nature, and also in the arts, the oxygen is condensed by the action of electricity on it, when it is known as active or nascent oxygen, also as ozonized air or ozone; this latter word can only be construed as referring to the state the oxygen is in—not as a substance *per se*. It has been known in science that the chemicals employed in this process generate ozone, but this has never been reduced to practice and not known to be adapted for sustaining and perfecting combustion in the manner as carried out in this process."

It is strange that in his application for a patent Mr. Hornbostel should have failed to mention ozone or ozonized air, when this is the thing which seems most necessary to make the whole scheme work.

* * *

The other day I came across the new catalogue of a concern manufacturing a certain line of machinery used by foundries. In the back part of the book there is a list of people who have at one time or another purchased machines and given letters of recommendation in their favor. The inference is that if a prospective buyer feels so inclined he may investigate the merits of these appliances by making inquiries at the place where they are in operation. I find in this case, however, that about half the concerns mentioned either have their names very badly misspelled, are out of existence, have no works at the address given, are now operated under another name, or are simply agents.

It seems to me as if the average manufacturer could, with benefit to himself, cut all dead timber out of his printed matter. If a concern buys a molding machine, for instance, writes a communication speaking favorably thereof, and later fails in business, there is no reason why this letter should continue to be reprinted. The machine may not have had anything to do with the failure of the firm, but on general principles, it is not a good policy to refer to abandoned plants as examples of what successful machines can do.

Again, if a letter of inquiry is returned, marked "No such firm," it shakes the faith of the intending purchaser in the honesty of the manufacturer, although the latter may simply be guilty of carelessness. Then, why refer anyone to the New York office of a firm, when the machines are in use in Illinois? A little time spent in carefully preparing a list of live shops, where appliances are in use, will repay every manufacturer who sends out printed matter describing his product. It is better to get along with fifty gilt-edged references than it is to quote a hundred, half of whom are dead or busted.

* * *

A few years ago a ton of arguments were advanced in favor of the center blast. How many cupolas of this style are in use today? Is this another case of a good thing being talked to death, or didn't it amount to anything in the first place? Or can it be that the cost of keeping a center blast cupola in operation is greater than the benefits to be derived from same?

Feeding Castings.

I have been pleased to note articles on this subject from time to time in THE FOUNDRY, and as very many castings are yet being rejected through being porous this shows that there is still much to learn along these lines, as no doubt much of this loss could be avoided by judicious feeding of the castings. This defect occurs where castings are of unequal proportion, such as pulleys, where there are heavy nubs and light rims, and on other castings where one may have an inch thickness in one part and four or five in another. Under such

circumstances I think it is advisable to use a feeding rod, because the lighter parts cool first and very rapidly draw the metal from the heavier parts. Of course these porous spots do not always show up on the outside of the casting but when this is broken up they are generally to be seen.

I will not say that all common iron castings require feeding. It has been my experience that the softer the iron the more feeding will the casting require, although it is not always necessary to use a feeding rod where one can utilize a riser large enough so that this will keep fluid until after the casting itself has become solid. I think it is wise to cool the risers, when these are set, by pouring some water on same, as this causes a compression and if there is any place likely to draw, it will force the metal down to it, providing all of this is done at the proper time. If feeding rods are used these should be properly heated before being put into the riser or feedinghead. In some cases it is wise, especially on a heavy job, to renew the head. In doing this I find that the best plan to follow is to cast a staple in the riser so that this can be lifted out without much trouble, but of course one must have some good hot metal ready to pour in when the riser is removed.

Judgment is required in placing feedingheads on castings. Let us for instance take a large flywheel, fifteen and twenty feet in diameter, with a very heavy rim, or half a wheel, it all amounts to the same. In such a case I should say about two places on the half wheel and four where this is cast in one piece, would be about right and then I think it is a good policy to replace these feedingheads when they begin to close up at the top. I am here referring to wheels where grooves have to be cut for wire or cotton ropes. It often occurs that a casting will be so designed that it is impossible to reach a heavy part which should be solid with a feeding rod, and a remedy which works well in such cases is to place a few wrought iron or malleable flat-headed nails with the heads standing into the mold one or two inches. Experience will soon tell one how many of these are needed to make the bulky part set at the same time as the lighter portion of the casting.

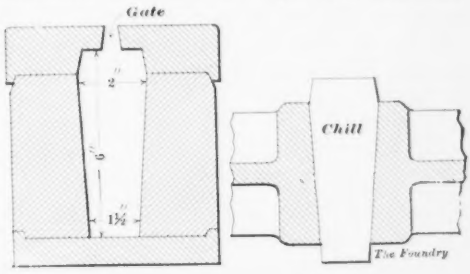
In concluding I would say that one firm in our neighborhood will not allow a riser or feedinghead to be placed upon a casting, and they are noted for making very good castings, too. I have noted that these people place their runner boxes up higher than is the general practice, which of course will have a tendency to put a greater pressure upon the casting. I should like to read a few more articles on feeding castings or making good castings without feeding them. There are plenty of men in the trade who could throw a lot of light on this subject if they would only venture to say a few words about it.

A. W. PEARSON.

The Difficulty of Using Chilled Cores.

Having had some experience in the use of chill cores in the casting of wheels for agricultural implements, which were made on molding machines and cast at the rate of eighty to one hundred per day, perhaps the remedy which I have found of use and economical may be of help to E. T. Harris, who explains some troubles he is having, in the February issue of THE FOUNDRY.

When we first used cast iron chills for coring out the hubs of wheels the chills were turned up in the lathe, but as the breakage amounted to from 6 to 10 per cent each heat



IRON MOLD FOR CASTING CHILL CORES.

and the chills were required to be interchangeable, the expense of turning these out was very great. To overcome this we designed an iron mold, as shown in the attached illustration. This was turned and faced and made in three parts, having circular guides turned near the outside edge of the joints. The metal was poured into the small tapered hole in the top part of the mold and any surplus which might lodge above the gate was scraped away before it had a chance to set. As soon as the iron set in the chill the same is driven out of the mold, care being taken not to injure the edges of the iron mold.

By adopting this method the molders who work on these wheels were able to always have a supply of chill cores on hand by casting a few each day. These chills were dipped in oil and dusted with plumbago before being set in the mold and were driven out of the casting when the same had become cold.

GEO. BUCHANAN.

Among the Foundries.

The foundry formerly operated by Baxter & Co., at Canton, N. Y., has been purchased by W. D. Evans, who will continue the manufacture of Baxter plows and in addition carry on a general jobbing business. O. G. Baxter has been selected as manager.

The Variety Iron Works, Seattle, Wash., are erecting a foundry 100x60 feet, with a twenty-foot wing, a short distance from their present location. This will be equipped with modern appliances to handle a rapidly increasing trade. Geo. James is manager of the works.

The Southern Car Mfg. & Supply Co. has been organized at Beaumont, Texas, by W. W. Wilson, A. J. Wiggs, F. M. Aldridge, R. C. Duff, W. C. Aldridge, and J. C. Wiggs. The first buildings to be erected will be a machine shop 80x160 feet and a foundry 60x100 feet.

F. P. Waller has purchased the foundry at Alexandria, Ind., formerly operated under the management of J. R. Davis.

The Reading Radiator Co., Reading, Pa., are increasing the capacity of their foundry by an addition 60x80 feet in size.

The Knoxville Wheel & Foundry Co. has been incorporated at Knoxville, Tenn., with a capital of $25,000. What is now known as the Richards foundry will be taken over.

The W. D. Allen Mfg. Co., of Chicago, will build a modern brass foundry at 1095-97 Western avenue.

The plant of the Patterson Foundry Co. Cleveland, Ohio, has been sold to the Blakeslee Foundry Co., which has been formed by J. R. Blakeslee, of the Ajax Mfg. Co.

The Uniform Steel Co., manufacturers of steel castings, have purchased the old Eastern Carbon Co.'s plant at Rahway, N. J., for $40,000, and will spend between $45,000 and $50,000 in improvements and installing new molding machines, furnaces, etc. As soon as the newly acquired property is ready for occupancy the company will remove from their present location in Newark, N. J. The capital stock has recently been increased to $500,000. The officers are: M. F. Burns, president; S. Milton Schatzkin, vice-president; Geo. J. Rogers, treasurer; A. E. Williamson, secretary, and Walter H. Gray, assistant secretary.

The Los Angeles Foundry Co. have incorporated at Los Angeles, California, with a capital stock of $25,000. The directors are: U. G. Augustine, J. F. Waterman, Max Rochon, F. N. Rust, all of Los Angeles, and George Pugh of Kansas City, Mo., who now operates a foundry in the latter city.

The foundry at Churchville, N. Y., which the late G. O. P. Turner had operated for several years, has been sold to Harry Snyder and Michael Hughes, who will continue the business.

The Reeves Engine Co., Trenton, N. J., recently incorporated with a capital stock of $400,000, will materially increase the capacity of their plant by the erection of new buildings and the installation of additional machinery. The following officers and directors have been chosen: Clifton Reeves, president; William M. Muschert, vice-president; William A. Buckman, secretary; A. C. Reeves, treasurer; Wallace Buckman, Owen Moon, Jr., and Richard H. Reed, of New York City. The Executive Committee of the company is made up of A. C. Reeves, Owen Moon, Jr., and R. H. Reed.

The Greenfield Mfg. Co., of Greenfield, Mass., is a new concern which will manufacture electrical supplies. A brass foundry will be operated in connection with the plant.

The Old Colony Foundry Co. has been organized at East Bridgewater, Mass., with a capital of $12,000, by I. N. Nutter, R. W. Nutter and Edward Hobart, to operate the foundry formerly carried on by the Joshua Dean estate. Edward Hazard, late assistant foreman at the foundry of the Becker-Brainard Milling Machine Co., Hyde Park, Mass., will be in charge.

The Garden City Fan Co., of Chicago, will shortly transfer their manufacturing operations to their new plant at Niles, Mich., where a foundry 80x190 feet and a machine shop 80x200 feet have been erected and are now being equipped with machinery.

The J. H. Day Co., of Cincinnati, Ohio, will erect a new foundry adjoining their present plant which will be 100x165 feet in size.

The Jeanesville Iron Works, Jeanesville, Pa., are having plans prepared for extensions which when completed will give them double the capacity of their present plant.

The Eureka Steel Range Co., of O'Fallon, Ill., have been incorporated to manufacture stoves and ranges by W. G. Willard, A. A. Willard and W. G. Willard, Jr., who have operated a plant at that point for some time past.

The Crown Casting Co., of Marietta, Ohio, will remove their plant to Jackson, Ohio, and expect to be in operation at the latter point not later than June 1st. The company manufactures soil pipe, and will increase its capital stock to $50,000.

The James Cooper Mfg. Co., of Montreal, P. Q., have built a new foundry at Rockfield, a suburb, which will turn out all of the castings required by the company in the building of mining machinery and appliances used in railway construction.

The Somerset Mfg. Co. are building a foundry at Somerset, Ohio, and expect to start their plant about May 1st. The officers are as follows: E. A. Young, president; Charles Wilson, secretary, and L. V. Kullman, treasurer.

The new owners of the South Pittsburg Stove & Foundry Co.'s plant at South Pittsburg, Tenn., have incorporated under the name of the American Stove, Range & Foundry Co., with C. C. Huntington, of Memphis, as president; T. G. Garrett, of South Pittsburg, as vice-president, and John J. Bowers, secretary and treasurer. The company are capitalized at $120,000. The plant has a capacity of 40,000 stoves per annum, and foundry room for 150 floors. It originally cost, when built by the Perry interests of Sing Sing, N. Y., $250,000. The new owners claim that they will run it to its full capacity. A cast iron soil pipe plant was a part of the old foundry, and this will also be operated at an early date. When in full working order about 300 hands will be employed.

The Illinois Brick Co. is erecting a foundry and machine shop at Blue Island, Ill., where it will build and repair its brick machinery in order to secure better service than can be had from outside parties.

The O. S. Kelly Co., of Springfield, Ohio, have made arrangements for removing their plant to South Milwaukee, Wis., where a model factory will be built at once.

The Riter-Conley Mfg. Co., of Pittsburg, will erect the new plant of the Sharon Foundry Co., to be built at Wheatland, Pa. The main building will be 120x450 feet in size.

The Richmond Foundry & Machine Co., Richmond, Va., has been incorporated by J. Scott Parrish and Arthur Scrivenor.

The Waterloo Gasoline Engine Co., Waterloo, Ia., has increased its capital stock from $20,000 to $40,000.

The Nickelson Foundry Co., of Chicago, has been incorporated with $25,000 capital to operate a foundry and machine shop. W. A. Treat, E. L. Bowser and S. T. Nickelson are the incorporators.

It is reported that John McKauchan will build a foundry at Avondale, Pa. Mail matter should be addressed to Chauncey P. O., Pa.

Wilcox, Crittenden & Co. have begun the erection of their third foundry building at Middletown, Conn.

Nelson L. Rundio, of Williamsport, Pa., will erect a foundry at an early day. It will be 50x150 feet in size.

The National Stamping & Enameling Co. are installing a foundry department at Granite City, Ill., which will furnish the castings consumed in their works.

The Seaman-Sleeth Co., of Pittsburg, are making arrangements for enlarging their plant in the near future.

The foundry of R. C. McCully at Lancaster, Pa., has been acquired by John F. Barry and Frank J. Zecher, who have associated themselves under the firm name of Barry & Zecher, and will continue the business.

The Monongahela Foundry & Forge Co. has been organized at Monongahela, Pa., with a capital of $10,000 by Wm. S. Thomas, Edmund W. Arthur and Harry H. Patterson.

The Interstate Foundry Co., of Cleveland, Ohio, have let contracts for the building of a foundry for heavy casting. It will be 148 feet wide and 300 feet long and will cost $35,000.

Joseph Barnes is adding a small foundry to the industries of Minden City, Mich.

John Hughes has disposed of his shop at Evart, Mich., and will start a foundry at Mount Morris, Mich.

The Southern Illinois Machine & Foundry Co. has been incorporated to do business at Murphysboro, Ill., by M. Schauerte, W. H. Michael, Thos. J. Burton, Willard Schauerte and Edward L. Bencini.

The partnership existing between Kamke & Anderson, operating the Menominee (Mich.) Iron Works, has been dissolved and the business will in the future be carried on by Mr. Kamke.

The Shenango Machine Co., of Sharon, Pa., will double the size of their plant.

The plant formerly operated by Curtin & Butts at Alexandria, Va., has been incorporated under the name of Alexandria Iron Works Co., with $30,000 capital. The increased capital is to provide for extensive improvements to the foundry.

The Reddin Iron Works, of Syracuse, N. Y., has been incorporated with $15,000 capital. Matthew C. Reddin, A. S. Reddin and E. C. Sisson are the incorporators.

The Buffalo Foundry Co., of Buffalo, N. Y., will in a short time begin the erection of a new plant. It is the intention to provide one of the best equipped shops in Western New York.

Coffman & Kibler have purchased the Monteith foundry at Paragould, Ark., and will continue the business.

The Standard Steel Works will erect a gray iron foundry, 90x300 feet, at Burnham, Pa.

Ira Koch and E. S. Wyrang have opened a brass foundry at Benton Harbor, Mich.

The Hart Mfg. Co., which recently began business at Alexandria, Ind., is reported as adding a foundry to the plant.

The Davis-Walker-Cooper Co., lately organized at Youngstown, Ohio, with a capital stock of $50,000, are establishing a well equipped foundry, 60x150 feet, and other buildings will be erected as rapidly as possible. A general line of machinery for rolling mills and steel plants will be manufactured.

The Paris Plow Co., Paris, Ont., has been organized with a capital stock of $250,000. The company will build a plant for the manufacture of agricultural implements. Frederick Wiard, formerly of Batavia, N. Y., will be superintendent and manager.

The American Foundry & Construction Co., of Pittsburg, has applied for a charter. Frank C. Kohne, M. Murray, C. S. Miller, J. Miller and O. Percival are the incorporators.

The U. S. Wind Engine & Pump Co., Batavia, Ill., will erect a foundry 65x290 feet.

The Oswald Iron Works, Limited, New Orleans, La., has been incorporated with a capital stock of $20,000, to operate foundry and machine shops. Charles G. Oswald, Robert E. O'Connor, H. L. Loomis are the incorporators.

At Coraopolis, Pa., the Duquesne Steel Foundry Co. is extending its plant by an addition to its main building 100 feet long and 120 feet wide. This plant and that of the Lewis Foundry & Machine Co. at the same place are now being operated double turn.

The Atlas Engine Works, Indianapolis, Ind., has increased its capital stock from $550,000 to $2,000,000 The increase in the capitalization is to cover the cost of recent improvements and other large improvements now under contemplation. The officers are as follows: H. H. Hanna, president; Bement Lyman, treasurer; R. M. Coffin, secretary; H. H. Hanna, Jr., vice-president; M. R. Moore, superintendent, and E. K. Marquis, assistant treasurer. During the last year the company has completed the following buildings: A boiler shop, 70x900 feet, with wing 60x365 feet and independent power house; forge shop No. 2, 50x205 feet; foundry No. 2, 70x300 feet; foundry No. 3, 120x500 feet, and machine shop No. 4, 50x323 feet, three stories. Buildings now occupy practically all the room in the original tract of twenty acres, not already covered by buildings or railroad tracks. The company has purchased additional tracts of ground, comprising about twenty acres in all. On part of this ground it has under construction a central melting plant, where all the iron for its various foundries will be melted and carried to the foundries in ladle cars. Foundations are going in for a central power station, from which electrical transmission will carry power to all parts of the plant.

The National Car Coupler Co., of Converse, Ind., are doubling their capacity by the erection of two buildings, 110x40 feet and 100x30 feet. A new power plant with dynamos is also being installed, together with a number of electric traveling cranes. It is expected to have everything completed by June 1.

The Globe Iron Works Co., of Minneapolis, Minn., manufacturers of gasoline engines, will add a foundry to their plant as soon as possible. The company have recently become incorporated with a capital stock of $200,000.

A. Carpenter & Sons Foundry Co., of Providence, R. I., are building a foundry, 75x113 feet, to take care of increased trade. The equipment of the new shop will be operated electrically.

The Monarch Foundry & Machine Co., recently organized at Cincinnati, Ohio, have opened a well equipped foundry and machine shop and will carry on a general jobbing business. The foundry department is in charge of John S. Carr.

E. B. Marsh & Bros. Co., of Snydersville, Pa., have plans under way for the erection of a new plant for which contracts will be let in a short time.

The Richmond Stove Co., of Norwich, Conn., are building a 68x103 feet addition to their foundry and making other improvements which will give them increased capacity.

Grant P. Hall is erecting a foundry and machine shop at Clendenin, W. Va., and expects to have the same in operation in a few weeks' time. About $10,000 will be invested. John H. Hall will have charge of the new establishment.

An addition is being built to the foundry of W. H. Dayton at North Harpersfield, N. Y.

Kelley & Tannyhill will build a foundry 40x70 feet in size at Waterloo, Ia.

The Buckeye Engine Co., of Salem, Ohio, has been incorporated with a capital of $1,000,000

The Shaw-Gerlinger Steel Casting Co., recently incorporated at Milwaukee, Wis., by E. C. Shaw, William and C. A. Gerlinger, have decided to erect their new plant at West Allis.

The Insurance Stove & Range Co., of Covington, Ky., have incorporated with a capital of $20,000.

The Keystone Foundry Co., of Pottstown, Pa., has been incorporated by Nathan Hoffman, John Davis, John H. Henricks, A. K. Shaner, S. J. Schwenk, Newton Kline, J. H. Morris and W. M. Bunting. Capital stock, $25,000.

The B. D. Northrop foundry at Washington, Pa., is being enlarged.

The Central Machine Co. has purchased the Niagara Iron & Brass Foundry at Niagara Falls, N. Y. and will continue the operation of the plant.

Adjusting Stove Plate Prices.

Although in point of numbers the stove foundries form but about five per cent of the total, yet when considering the number of molders engaged in this industry it is entitled to a much higher rating. It also enjoys the distinction of being the only branch of the foundry business where piece work prices prevail throughout, and necessarily the adjustment of these for different patterns offers an interesting problem. For this reason we reproduce the following article from the *Iron Molders' Journal*, contributed by Ira Baughman of Spring City, Pa.:

No more interesting theme could be chosen for the discussion of the stove-plate molder than that which deals with the methods of setting prices on work. It is one which affects his ability to make decent wages and calls for eternal vigilance on his part in order that his skill may receive a just and equitable reward. It can not be said there is absolute uniformity in methods. Nearly every district has some features of similarity and others of wide difference. The subject in Eastern Pennsylvania has recently excited considerable discussion, and before I illustrate a system in common use and another which some of us think is more equitable, I will take the liberty of suggesting that stove-platers who have had experience in other districts could advance the interests of our branch of the craft by taking up the discussion and explaining the methods followed by them, or those which have appealed to them as being the fairest and most systematic.

I will first deal with a system which is in considerable vogue but which, nevertheless, I deem to have many unfair features and call it Rule No. 1.

Rule No. 1—Briefly stated, this rule premises that, having set the molding price of a piece of work belonging to a certain size of stove, the price of the same piece on all other sizes can be set by adding to or subtracting from that price one-half cent for every inch of difference in length, breadth and depth according as the piece is larger or smaller than the original one.

Let me illustrate this by a few examples: We have a No. 6, No. 7 and No. 8 range bottom.

The No. 7 is 32 inches long and 25 inches wide, and the price has been set at 30 cents.

The size of the No. 8 is 35 inches long and 27 inches wide. Applying Rule No. 1, this bottom being 3 inches longer and 2 inches wider than the No. 7, its price would be $30+1\frac{1}{2}+1=32\frac{1}{2}$ cents.

No. 6 is 29 inches long and 23 inches wide, so that its price by the same rule would be $30-(1\frac{1}{2}+1)=27\frac{1}{2}$ cents.

In each of these cases it is presumed that the depth is the same.

Let us now take the No. 14, No. 16 and No. 18 parlor heater bottoms where the depth also would vary.

The No. 16 is 22 inches long, 19 inches wide and 4 inches deep, and the price 24 cents.

The No. 18 is 24 inches long, 21 inches wide and 5 inches deep; or 2 inches longer, 2 inches wider and an inch deeper. Its price by Rule No. 1 would therefore be $24+1+1+\frac{1}{2}=26\frac{1}{2}$ cents.

The No. 14 being $19\frac{3}{4}$ inches long, $17\frac{1}{4}$ inches wide and 3 inches deep, its price would be $24-(1\frac{1}{8}+\frac{7}{8}+\frac{1}{2})=21\frac{1}{2}$ cents.

I will now describe a method which appeals to me as being more equitable, and illustrate its operation by working out the same examples. I will call it Rule No. 2.

Rule No. 2—The molding price of a certain piece of work having been set, the price of the same piece of all other sizes of the stove would be as the ratio of its area or volume to that of the one set; that is, the area (or volume when the depth differs) of the smaller is to the area of the larger as the price of the smaller to the price of the larger.

Taking the first example—range bottoms, we find that the depth of flask required is practically the same in the several sizes, so that in computing what should be their relative prices it is not necessary to give the depth consideration, which can be done without altering the result.

To apply Rule No. 2 it is first necessary to determine the area of each bottom, which is done by multiplying the length by the breadth. Thus:

No. 6—29x23=667 sq. inches=area.
No. 7—32x25=800 sq. inches=area.
No. 8—35x27=945 sq. inches=area.

The price of No. 7 has already been set at 30 cents; that is, a bottom containing 800 sq. inches is made for 30 cents, and dividing 800 by 30 we find, so to speak, that 26 2-3 inches of surface is molded for one cent. That being the case, then for every 26 2-3 inches contained in the bottoms of the other sizes one cent should be paid.

Let us see how this would work out:

No. 6 contains 667 sq. inches, its price would therefore be 667÷26 2-3=25 1-80 or 25.01 cents.

No. 8 contains 945 sq. inches, its price would therefore be 945÷26 2-3=35 7-16 or 35.43 cents.

In the case of the parlor heater bottoms depth is a varying quantity and instead of taking the measurements of the pattern itself, I would suggest that we determine prices by the size of flask required.

No. 16, whose price has been set at 24 cents, measures 22x19x4. Allowing an inch of sand margin it would require a flask about 24x21x11.

Placing the depth of the flask of No. 16 at 11 inches, that of No. 14 would be 10 inches, and No. 18, 12 inches. This includes cope and nowel.

To compute the volume of these flasks for purposes of comparison we multiply their length, breadth and depth together and the result will represent the volume in cubic inches. Thus:

No. 14—21¾x19¼x10=4186.875 cub. in.=volume of flask.
No. 16—24x21x11=5544 cub. in.=volume of flask.
No. 18—26x23x12=7176 cub. in.=volume of flask.

The price of No. 16 having been set at 24 cents, we find that a bottom whose flask contains 5544 cubic inches pays 24 cents. To determine what the No. 14 with a flask containing 4186.875 cubic inches would pay we proceed as follows:

A flask containing 5544 cub. in. pays 24c.
A flask containing 1 cub. in. pays $\frac{24}{5544}$c.
A flask containing 4,186.876 cub. in. pays $\frac{24}{5544}$x4186.875=18.125c

By the same process it would be determined that the No. 18 would pay 31.06 cents.

Let us now recapitulate the prices of these two series under Rules No. 1 and No. 2.

Range bottom	Price by Rule No. 1	Price by Rule No. 2
No. 6	27½	25.01
No. 7	30	30
No. 8	32½	35.43
Parlor heater bottom	**Price by Rule No. 1**	**Price by Rule No. 2**
No. 14	21½	18.125
No. 16	24	24
No. 18	26½	31.06

Thus it will be seen that the prices of the smaller sizes under Rule No. 1 are in each case better than they would be under Rule No. 2; but the prices of the larger sizes, just the reverse. Foundrymen may contend that Rule No. 1 is therefore just as fair on the whole as Rule No. 2. If there were always an odd number of sizes and the prices were first settled on the middle one, it might *seem* somewhat fair; but, in my opinion, it is not fair even then as the men making the larger sizes will have a much poorer job than the men making the smaller sizes. But that is not the worst feature where Rule No. 1 is in operation. Foundrymen are shrewd and quick to take advantage of a situation, they therefore insist on pricing the smallest size first and in this way get considerably the best of the deal.

I don't know that this subject has ever been discussed in the *Journal* before, but it is a most interesting one to a stove-plate molder, and a full understanding and interchange of views upon it will be of incalculable benefit. I have simply treated upon the subject of pricing other sizes from the price of one that has been set; but the whole subject of pricing is an important one and worthy of discussion. I realize that in pricing the first stove of any line, good judgment and comparison with similar stoves must necessarily enter into the determination of its price. Difficulty of molding will necessarily influence one's judgment, and it is not to be expected that a set formula could be devised which would enable us to set a price on any piece of work by simple figuring, but there are important points that might with profit be made more uniform.

Deaths.

Philo Hurd Skidmore, founder of the Pacific Iron Works, of Bridgeport, Conn., died on March 21 at his residence, at Newtown, Conn., aged 84 years.

Solomon Cole, the founder of the firm of S. Cole & Son, Lebanon, N. H., died April 3 at the age of 81. He learned the foundry business while a young man and started the enterprise which bears his name in 1866.

Nelson M. Beach, treasurer and general manager of the Bridgeport Brass Co., Bridgeport, Conn., died March 19, aged 46.

John Heald, proprietor of the Phœnix Foundry, Chorley, Lancashire, England, died recently, aged 60.

James Jolly, senior member of the firm of J. & W. Jolly, Holyoke, Mass., proprietors of the City Foundry, died March 26.

U. B. Stribling, a veteran foundryman of Madison, Ind., died April 2, aged 77.

T. G. Gaylord, at one time owner of the Newport, Ohio, pipe foundry, died recently.

Alexander Duncan Forbes, president of the Rockford Malleable Iron Works, Rockford, Ill., died March 30. He was born in Deanston, Perthshire, Scotland, Dec. 13, 1831, and came to America in 1842. In 1854 he became a resident of Rockford, and during that year, in partnership with his father, Duncan Forbes, established a foundry and engaged in the manufacture of stoves and machinery castings. Mr. Forbes was one of the first men in the West to see the possibilities of malleable iron manufacture, and in 1864 the firm established the first malleable iron works west of Cincinnati. The business later grew into the Rockford Malleable Iron Works, of which Mr. Forbes was president.

W. Riley Brown, president of the Columbus Iron Works and of the Southern Plow Co., of Columbus, Ga., died March 28, aged 80 years. He was one of the pioneers of the iron industry in Georgia. Mr. Brown was born at Monticello, Ga., and went to Columbus when 17 years of age. He learned the molding trade, and in 1851 became connected with the firm of Wildman & Craig. In 1855 he, with others, organized the Columbus Iron Works, and was made superintendent, which place he filled until 1860, when he was made president of the company. In 1861 the Confederate Government converted the iron works into a naval station, and it was employed for building gunboats, cannon, artillery wagons and gun carriages and also shells and shot for artillery until the close of the war, when the Federal forces took possession of the city and partially destroyed the works. Some of the best war material made for the Confederacy was turned out at these works under Mr. Brown's supervision. After the war the Columbus Iron Works began the manufacture of machinery, boilers, engines and foundry work of all kinds.

Willliam R. Snead, president of the Snead & Co. Iron Works, of Jersey City, N. J., was found dead in his bed on March 27 at his home, 17 West Thirty-fifth street, New York City. Mr. Snead had been in indifferent health during the winter. His death was attributed to an attack of apoplexy. He became president of the iron works upon the retirement of his father some years ago.

Fires.

The plant of the Ridgway Mfg. Co., at Ridgway, Pa., was damaged to the extent of $10,000 by a recent fire.

A fire at the Ideal Stove & Foundry Co.'s plant at Daleville, Ind., destroyed about $6,000 worth of patterns March 30.

The Enterprise Foundry Co., of Greentown, Ohio, lost their entire plant through fire on March 25.

The foundry of S. L. Moore & Sons Co., Elizabeth, N. J., sustained $10,000 damage through a recent fire.

The Liberty Brass Works conducted by Wm. Harris & Son, at Baltimore, Md., was damaged by a recent fire.

The J. G. Wagner Co., of Milwaukee, Wis., had their foundry and pattern shop damaged to the extent of $10,000 by fire.

The Lowville Iron Works, of Lowville, N. Y., was burned to the ground March 19. The loss is $6,000, on which there is insurance for $3,500.

The plant of the Noble & Johnston Machinery Co., Hoosick Falls, N. Y., was completely destroyed by fire recently. It consisted of a large pattern shop, machine shop and foundry. The loss is estimated at $60,000.

The foundry of the Western Hardware & Mfg. Co., Milwaukee, Wis., together with its contents, was damaged in a fire April 7. The loss is fully covered by insurance.

Personal.

John M. Taylor, general manager of the Dominion Radiator Co., Toronto, Ont., and his brother, Mr. Adam Taylor, assistant manager of the company, have resigned to enter into the foundry business in Guelph. Both gentlemen have been connected with the company since its inception in 1887.

Louis Knapp, who has been foreman of the iron foundry of the Pullman Co., Pullman, Ill., for some years, has resigned to accept a position with the McCormick Harvesting Machine Co., Chicago, Ill.

Thomas A. Angell has accepted a position as foreman in the foundry department of the Boynton Furnace Co., Jersey City, N. J.

Peter Ward has been placed in charge of the foundry of the Carbondale Foundry & Machine Co., Carbondale, Ill.

W. G. Smith has been appointed superintendent of the Maywood Branch of the Featherstone Foundry & Machine Co., Maywood, Ill.

Ed. Voelkel has been appointed foreman of the malleable iron foundry of Forster, Waterbury & Co., Franklin Park, Ill.

H. J. Holmes will hereafter have charge of the foundry of the Brown Bros. Mfg. Co., Chicago, Ill.

Truston Clark has been appointed foreman of the foundry of the Pomona Mfg. Co., Pomona, Cal.

R. T. Faircloth has accepted the position of foundry foreman with the Southern Stove Co., of Richmond, Va.

Jacob Ott, who for the past eight years has been at the head of the Plano Mfg. Co.'s foundry, at West Pullman, Ill., recently resigned that position.

John A. Roe, formerly connected with De Haven & Co., of Allegheny, Pa., has completed the organization of a new concern at Ellwood City, Pa., who will operate a foundry under the name of the Pennsylvania Stove Co. Grant McCammon will have charge of this department.

Stephen Wisner has been appointed foreman of J. Woodruff & Sons' foundry at Salem, Ohio.

From Mudville—Smith Proposes to Bring Things Up To Date.

The proprietors of our foundry here in Mudville are very much like those in most other foundries in respect to improved methods. That is, they are apt to pay a good round price for some new invention, exploited by a glib talker, that may realize a saving of 10 per cent in cost of molding, while neglecting to make improvements at the suggestion of their own foreman that would be equally or even more valuable. I don't mean to say that there is anything wrong in this. It's just human nature. It is so universal a characteristic of men everywhere that no argument is required to establish the fact. It is the same in politics, religion, business, love, and, in fact, in every field of human activity. In politics, you always send away from home to get a speaker; the preacher from abroad fills the house to overflowing; business men in other cities are up-to-date; the foreign lover plucks the blushing Rose from the bosom of "our John," and—well, you know how it is yourself.

Smith came into the foundry one day a few weeks ago, and I knew by his extra nervous step and manner that something was brewing. "Say, Bucks," he exclaimed, after a few general, meaningless remarks, for an opening, "Say, Bucks, the more I go about the country, the more I know that we've got to do something or shut up shop!"

"Well," I said, "we are running ten hours a day, and have been doing so for—"

"That's all right; we're putting in time enough; no question about that. And the company pays for it—whether anything is done or not; there hain't a blanked man in the hull shoot'n gallery but what'll turn in sixty full hours every pay day from Jenyary to Jenyary, work or play, if they wan't watched!"

"Well," I said, "Mr. Smith, I'm glad to see that your opinion of the men in your employ agrees so well with my own I have not failed to note the practically identical character of these men and their employers."

"Hey?"

I made no reply to this ejaculation. I meant what I said, nothing more, nothing less, and I wished to give Smith time to digest it.

I know that my face was reddening, and that Smith observed it. For he laughed just a little and said, rather deprecatingly:

"Oh, well, of course, that's all right, Bucks; I'm no angel; and, in fact, I ain't finding no fault with the men. Fact is, I'm jest a kickin' myself. Now, look at that"—he pointed at a set of washer patterns attached to a gate—"two, four, six, eight, ten—ten of them little patterns that won't weigh an ounce apiece, on one gate, and 2 cents a flask for molding or I'll eat my head!"

"Your head is safe for this time, Mr. Smith."

"Yes. Now, I was down at B— the other day, and they've got a machine there for molding just that kind of washers twenty-six in a flask—more than twice and a half again as many as we get—and one man will turn out enough in two days to last all season!"

I asked Smith how much the machine cost. He said he believed it was about $120—"patterns and all."

Then I told him that if he would have a new set of patterns made, such as I had asked him for several times during the last few years, with twenty-four patterns on a gate, and all soldered and riveted to a plate, the latter to extend through the joint of the snap-flask, we

could make the castings as fast on a squeezer, or molding press, as anybody could make them on the costliest molding machine in the world.

"D'ye think so?"

"No," I said, "I don't think anything about it—I know it."

"How much will the patterns cost?"

"From $10 to $15."

"How many of those washers do we make in the year?"

"We made 16,000 last year."

"Yes; well, this season's order is pretty near out, ain't it?"

I told him that about one-third were to be made yet.

"Well," he said, "we ll see."

Those patterns have not been made yet; and they will not be made before we shall have got well along with next season's work; possibly—almost probably—not then.

Meantime, there are several dozens of sets of patterns, that were attached to the gates in much-spread-out fashion, with no adequate regard to economy of space, the molding of which could be cheapened from 10 to 50 per cent if properly constructed. In addition to these, there are many others having but few patterns attached, on the common plea that "we don't know that we shall ever make very many of them," and so they have run on, from year to year, in the smallest size flask that we have, which is 30 per cent smaller than the maximum size that commands the minimum price for molding. That is to say, we are paying 30 per cent more than necessary for the molding of these castings, and have been doing so for years past.

Of course, it would cost a good deal of money to make over and enlarge these cards of patterns. But the saving in cost of molding would pay the cost of patterns many times over.

But what strikes me as being rather ludicrous is the avidity with which many foundry operators will go in for buying molding machines, while totally neglecting the ordinary economies. I am not at all averse to the molding machine; it's all right in its place. And it has a good many places for economical use. But if foundrymen generally would spread out their patterns where they could be easily seen and examined, and would then figure on the saving that could be effected by rearranging they would be surprised.

To illustrate: A certain "gate" of patterns contained six pieces; two more were added, at a cost of $5, with the result of a saving of $107 on one year's work. Another, the cost of patterns was $28, the saving on the year's product was $88.50. I could add to this list indefinitely. But if you will go over your own stock of patterns and do the right thing by yourself, you will have a great big list of your own; and it will be a pleasant thing to contemplate when you get it into good money-making order.—["Mr." Bucks, in *The Tradesman*.

Taking the Bull by the Horns.

A certain general manager has developed what seems to us quite a novel way of dealing with the union problem. Shortly after employing a man in his machine shop he received several letters from another town informing him that this man was a very bad specimen, that he was an agitator from agitatortown, that he stimulated the workmen to do all sorts of disagreeable things, was a bad citizen generally and a bad man to have about a shop—a disturbing element, in short. Calling the man into his office, he said to him: "I understand that you are an agitator and that you devote a good deal of energy to stirring up dissatisfaction and trouble." "Well," the man said, "I don't know that I have done anything particularly wrong in that line, although I have taken an active part in some labor difficulties." "Well," said the superintendent, "if you can handle men in the way these letters say you can and make them do things that they otherwise would not do, I think you can handle them in this shop if you have a mind to, and I want you to take charge of all the lathe work and see that it is done in good shape and that a full day's work is done. In short, I would like you to be foreman of the lathe department." The man was, of course, astonished, but he said that he would take hold of it and do the best he could, and this he has been doing ever since; the superintendent being ready to testify that he is a most excellent and most satisfactory foreman in every way. He knows what a day's work is, and requires that it be delivered by every man every day, and the men seem perfectly satisfied to do it for him continuously and uniformly.—*American Machinist*.

A Good Sign of Business Ability.

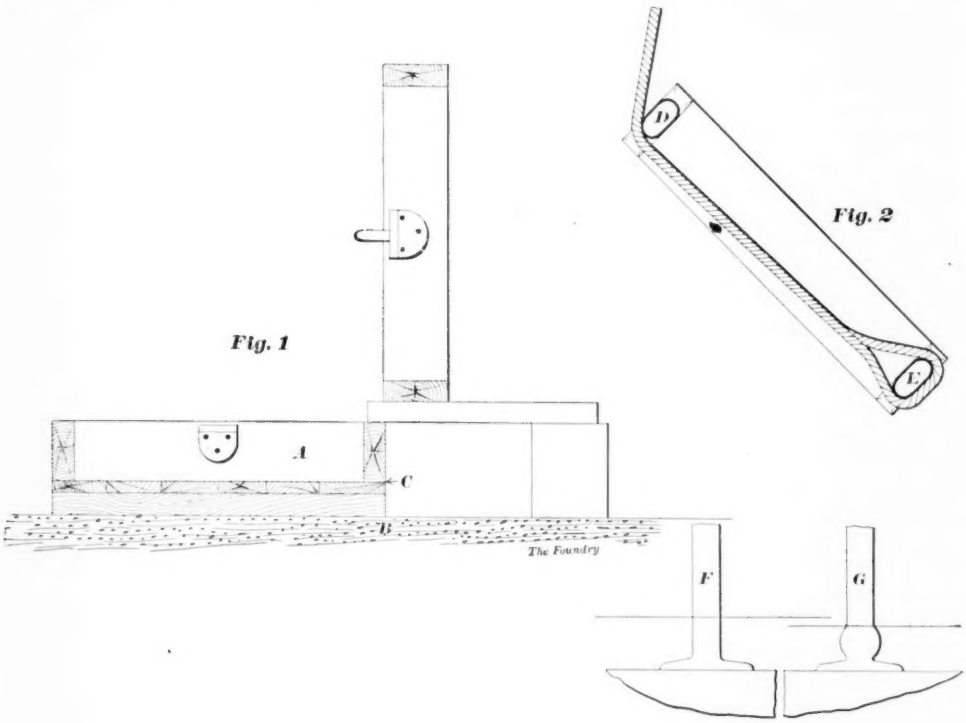
Mr. McDonald, the new proprietor of the foundry, has been making quite an improvement about his business premises by cleaning up all the iron scraps and pieces of useless material.—Black River Falls (Wis.) *Banner*.

One Thing and Another.

The molder who keeps his eyes open will see new examples of failures every day, particularly is this so if he is working in a jobbing shop. Of course, it is not going to do him much good merely to look at these, but if he will reason out the cause at an early opportunity, he will be making of himself a better mechanic, and the chances are that when a favorable opening occurs, he will be promoted as a direct result of taking an interest in his work.

It sometimes happens that a rather heavy mold is put up on a side floor away from the reach of the crane, when it becomes necessary to "roll" the cope off. Now, it has been my experience that on such occasions the drag part (A) often sags on the side where the weight of the cope tends to disturb original conditions. This also helps to destroy the correct outline of the mold and makes one of the mysteries nobody can account for after the casting is made. The trouble is caused by the molder either having the bed of sand soft underneath the batten (B) or else too much sand between his bottom-board and drag, which leaves an opening at C that is squeezed together when the weight of the cope is placed on the edge, as shown in Fig. 1. Let every joint be solid and there will be no springing because a cope is rolled off instead of lifted away altogether.

When we hear a molder state that a flask springs and causes a drop out, it is well enough to investigate the cause thereof to see if Mr. Molder himself does not make it spring by the way he is handling it. In rolling a heavy cope over, most of us have seen the bright individual who hitches the sling onto the handle (D, in Fig. 2) and swings the whole thing clear. Is it not reasonable to suppose that letting the weight of the cope be handled in that way is going to cause more or less springing between D and E, and that this change of stress should cause evil results? By lifting a cope by the handle D the tendency is for E to pull away from D, while by turning it, as shown, with the sling hitched onto E, no attempt is made to pull the flask to pieces. Of course, it is all well enough to say that a foundry flask should be strong enough to be lifted any way, but the fact remains that after all, we would get along better if we paid a



little more attention to what we are doing, and did not ourselves cause things to happen by the way we handle tools of one kind or another.

Cast iron chaplets are not used to the ex tent they formerly were, although many shops still cling to their use. A couple of years ago I had my attention called to one of the freaks of such chaplets. A certain foundry had an order for some piston valves which would weigh probably about sixty pounds. Just a plain pipe, so to speak, with a small print at each end. The thickness was not much over a quarter of an inch, except where the chaplet was placed, where a recess was made in the core allowing between three-eighths and half an inch of metal. The superintendent of the machine shop was one of these fellows who is always finding trouble, seemed as if he could see through an opaque body, and I must say he was the right man to straighten things out. One day he had one of these valves cut in two, and instead of finding a section as represented at F, Fig. 3, it looked like that shown at G. The cast iron chaplet had squeezed together and let the core come a certain distance upwards, but not enough to cut through. The surprising feature of this failure is that with a casting of such thinness the chaplet could be heated to a plastic condition soon enough to permit it to change its shape.

Notes from Various Sources.

The DeCamp Bros. & Yule Iron, Coal & Coke Co., of St. Louis, has been incorporated with a capital of $300,000, and the following officers: President, A. P. De Camp; vice-president and treasurer, William Yule; secretary, F. B. De Camp; assistant secretary, A. Yule.

There has been a phenomenal advance in Ceylon Plumbago during the last thirty days. The price has advanced 2½ to 3 cents per pound on the Crucible grades, and in about the same proportion on the facing grades. An absolute scarcity is reported, both in Europe and the United States. There are no reserve stocks, and the importers predict a steadily advancing market up to Sept. 1st at least. The Crucible manufacturers are much concerned, for none of them are carrying heavy stocks, as they were all looking for a decline. Latest cables from Ceylon indicate all offers refused, and it looks very much like a corner in this staple. The upward trend in prices began in 1899, since which time there have been occasional declines only to be followed by further advances, thus keeping both consumers and manufacturers in a state of uncertainty. Only native labor can stand the unhealthy conditions prevailing in the Ceylon mines, and higher prices instead of stimulating production seem actually to have had the effect of curtailing it.

The Chicago Pneumatic Tool Co. have removed their offices from the Monadnock block and will hereafter occupy nearly all of the tenth floor of the Fisher building with their Chicago office. The New York office will remain at 95 Liberty street.

The Thomas Furnace Co., of Milwaukee, Wis., have completed the improvements to what was formerly known as the Minerva furnace. Dock facilities have been provided, together with a Brown system of ore handling machinery. A new power plant has been installed and the furnace practically rebuilt. It is expected to produce about 200 tons of foundry iron daily. A fine laboratory forms part of the equipment.

A very neat catalogue is being mailed to the trade by the Philadelphia Pneumatic Tool Co., of Philadelphia, describing the appliances made by that company. In addition to information relating directly thereto the catalogue also contains tables of capacities, weights, dimensions, air consumption and other matters of interest to users of pneumatic tools.

The Peekskill (N. Y.) Facing Mills, for many years conducted by the late Robt. MacKellar, and lately by his sons, was entirely destroyed by fire March 31. We are advised that the plant will be rebuilt on a large scale and equipped with modern machinery and appliances and the business continued as before.

The J. D. Smith Foundry Supply Co., of Cleveland, O., have issued a neat booklet on "Plumbago and Silver Lead," dealing with the mixing and refining of same. In view of the fact that it has been thought unlawful for the supply men to sell anything but the pure article the following paragraph will be of interest:

The first item is the absolutely pure Ceylon Plumbago or East India Silver Lead. We frankly say that to use it as it is, without adding a bond in mixing, such as Talc, it will positively not be satisfactory for foundry work. The pure material, no difference how refined, contains no bond, a most necessary addition to Plumbago for use on green sand or dry sand molds. In its pure state, put through a 120-mesh silk bolting cloth (which makes it impalpable dust) it lacks body, will rub or blow off and fails almost entirely to cover the surface of the

sand evenly or satisfactorily, as the result will show after casting is poured, or if used on dry sand molds it is more noticeable, for the pure material can be easily brushed off after molds are dried. Therefore, we advise that pure, unadulterated Plumbago be not purchased, unless a bond be added before using it. A large number of foundrymen are fully conversant with this, and adulterate the pure article in accordance with the work in hand.

Some Anecdotes—Second Chapter.

Jack got a special job; it was a flat back but nevertheless Jack felt proud of it because one part was to be as hard as armor plate and the lugs and fitting parts were to be as soft as lead so that it could be planed to match the other part; it was a door for a safe and weighed about 500 pounds. Jack went home that night and studied West's book on "Foundry Practice," especially the item: "The more sulphur iron contains the harder the casting," when an idea immediately struck him. The next morning Jack entered the shop with a triumphant smile on his face for he had solved the problem; he worked as if he had the power of a steam engine all that day. Finally the blast was turned on; but before Jack closed the cope on the drag he placed a package wrapped in a German newspaper in the part that was to be chilled. Then Jack was called to cast and he still had that triumphant smile on his face; he started to pour not caring whether the iron was too hot or too cold, when in about twenty seconds the iron shot through the head up to the foundry roof. His partner dropped the shank, but Jack stuck to his like the "boy to the burning deck," and by wasting about a ton of metal, which was run through the heads, the iron in the mold stopped bubbling and settled down. The foreman asked Jack what caused the casting to blow and he replied: "Never mind; it's all right. There is not a better safe door in the world than the one that I made today by my new process." The next day the mold was shaken out and the part that ought to have been as hard as armor plate was half full of holes.

The old man called Jack out to the scrap heap and by cross-examination Jack made the following statement: "Mr. West in his book on founding says that the more sulphur iron contains the harder the casting will be, so I laid eight boxes of sulphur matches in the chilled part of the casting, but I guess the wood that the matches were made of was not the right kind and it had a very funny effect on the iron."

The cupola tender smashed his thumb so Jack was given the job. The first day, as he was tapping out the iron, he crushed in the breast, so the foreman said: "Tomorrow just ram that breast a little harder," and Jack replied, "Don't worry; I'll fix it all right tomorrow." The next day Jack laid a couple of pigs of iron against the breast and everything was all right till it came to tap out the iron. Jack tried to push the tapping bar into the hole, but in vain, for it only struck the pig of iron. Jack was in a dilemma and he called the foreman, who tried to drop the bottom, which was bridged, and then the iron ran out of the tuyeres. Jack ran into the office and told the old man that there was something the matter with the cupola. The old man asked Jack what it was and he replied that the cupola was stuffed, that the iron was leaking out of the wind holes and that the cupola must be crazy. The old man never found out that pigs of iron were in front of the tapping hole; although it cost him new fire bricks up to the tuyeres, a day's work with hammer and chisel getting the iron out of the tuyeres, also the loss of a day's cast.

W. E. F.

Pin Holes in Aluminum Castings.

We are greatly troubled by numberless small pin holes in our aluminum castings, says a correspondent in the *Aluminum World*. When the metal is polished these holes drag and tear and give the surface an unsatisfactory appearance. What is the cause and how may we avoid the difficulty?

To these questions the following reply is made: This is one of the most common difficulties with which the aluminum foundryman has to contend. It almost invariably happens to a more or less extent if copper is the hardening ingredient which is used with the aluminum and is caused by overheating the metal in the crucible. "Soaking" or allowing the metal to remain in the fire, even at a moderate temperature, will also do it. With the alloys in which zinc is used for the hardening ingredient the presence of pin holes is not so apt to occur, but unless the temperature of the melted metal is kept down as far as possible, it is likewise liable to occur with such alloys. In short, the cause of these pin holes is the overheating of the metal.